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# TM 5-223C

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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## GERMAN MINE WARFARE EQUIPMENT

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DEPARTMENT OF THE ARMY

MARCH 1952

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*This manual supersedes chapter 8, FM 5-31, 1 November 1943.*

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# PART ONE. INTRODUCTION TO FOREIGN MINE WARFARE EQUIPMENT

## CHAPTER 1

### GENERAL

#### 1. Scope and Purpose

a. This manual is the third in a series of manuals containing detailed technical information on foreign mine warfare equipment. This manual covers mine warfare equipment used by the German Army in World War II. The various types of fuzes; mines; antilifting devices; booby traps; mine laying, marking, and recording equipment and supplies; and mine detecting and clearing equipment are described and illustrated. TM 5-223A, Soviet Mine Warfare Equipment, and TM 5-223B, Oriental and European (Except British, French, German, Italian, and Soviet) Mine Warfare Equipment, are the first two manuals in this series.

b. The series of manuals on foreign mine warfare equipment is a basic guide to be used in the identification and employment of foreign mine warfare equipment and for the neutralization of foreign mines and fuzes.

c. Information on foreign mine warfare policies and tactics is contained in FM 5-32.

#### 2. Development of Mine Warfare

Originally mine warfare consisted of tunneling beneath the enemy and using explosives to destroy otherwise impenetrable positions. This type of mine warfare continued through World War I. During the later part of World War I, when tanks made their appearance, both the Germans and the Allies began to use land mines constructed of artillery shells. The importance of mine warfare was not definitely established

until World War II. Large mine fields placed in key locations helped the British hold back the Germans in North Africa. Extensive use of mines by the Soviet Army contributed materially to delaying the German advance into the Soviet Union. Mines were also extensively used in the fighting in Italy and during campaigns in France and Germany. In Korea mines have been employed extensively.

#### 3. Mine Terminology

a. A *mine* is an encased charge of explosive placed under water, laid on the ground, or buried. To detonate the mine, it is necessary to provide one or more detonating devices. The elements of a mine are shown in figure 1. The types of mines used in foreign mine warfare are discussed in paragraph 5.

b. A *fuze* is a mechanical, chemical, or electrical device which starts the firing chain of a mine (par. 4). Fuzes are classified according to use (instantaneous or delayed-action), the type of initiating action required to start the fuze functioning (par. 4a), and the internal action which produces the flame or spark (par. 4b).

c. *Installing the fuze* is the insertion of the detonator and fuze assemblies into a mine.

d. *Arming* is the removal of all safety devices so the mine is ready to function (fig. 2).

e. *Neutralizing* is rendering a mine ineffective.

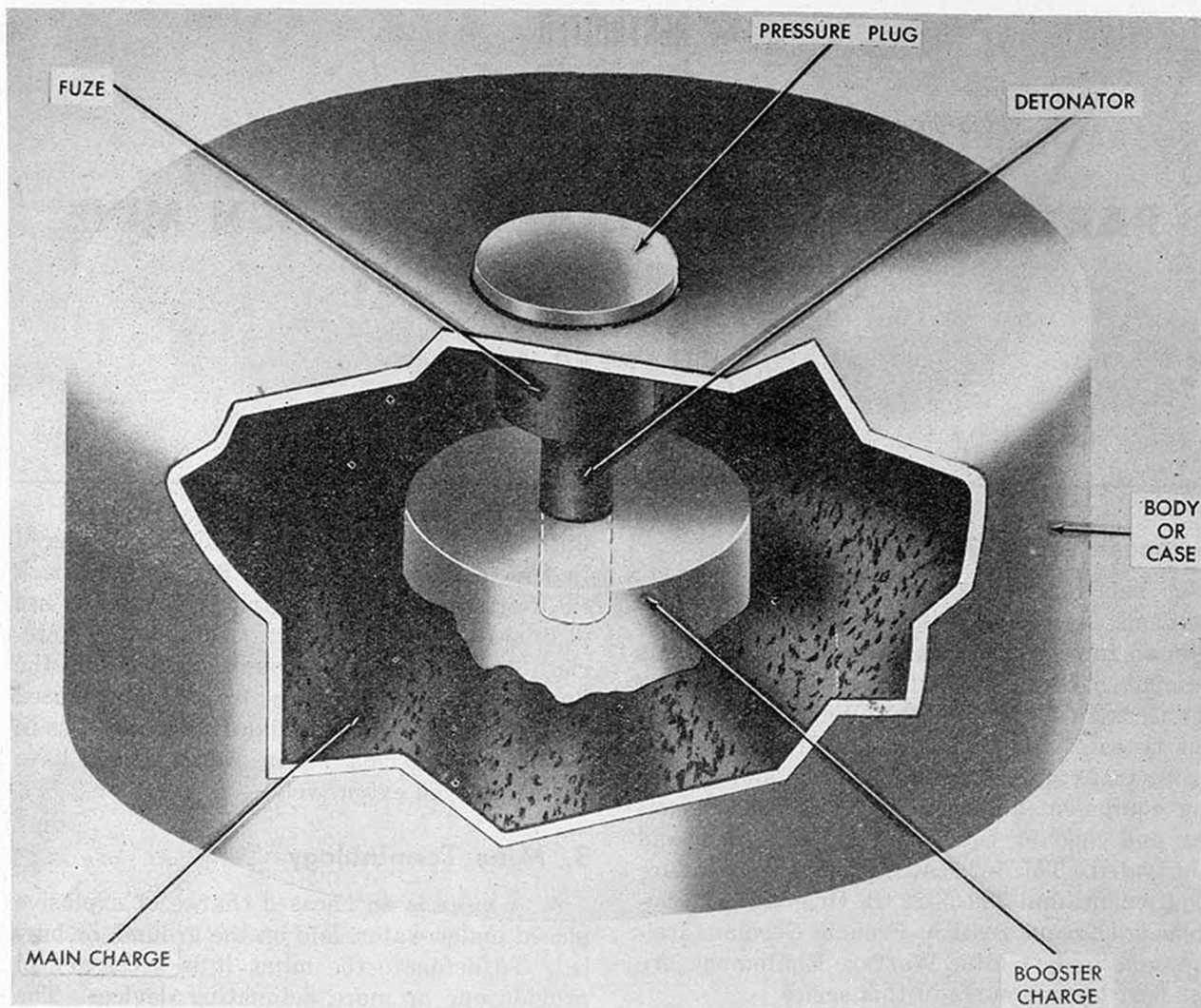


Figure 1. Elements of a mine.

f. An *activated mine* has a secondary fuze which will cause detonation when the mine is moved. The device can be attached either to the mine itself or to a second mine or auxiliary charge beneath or beside the mine (fig. 3).

g. *Sympathetic detonation* is the detonation of one or more charges induced by the explosion of another charge (fig. 4).

h. The *effective casualty radius of a mine* is that radius within which 50 percent of all personnel will become casualties when a mine is detonated. It is expressed in yards.

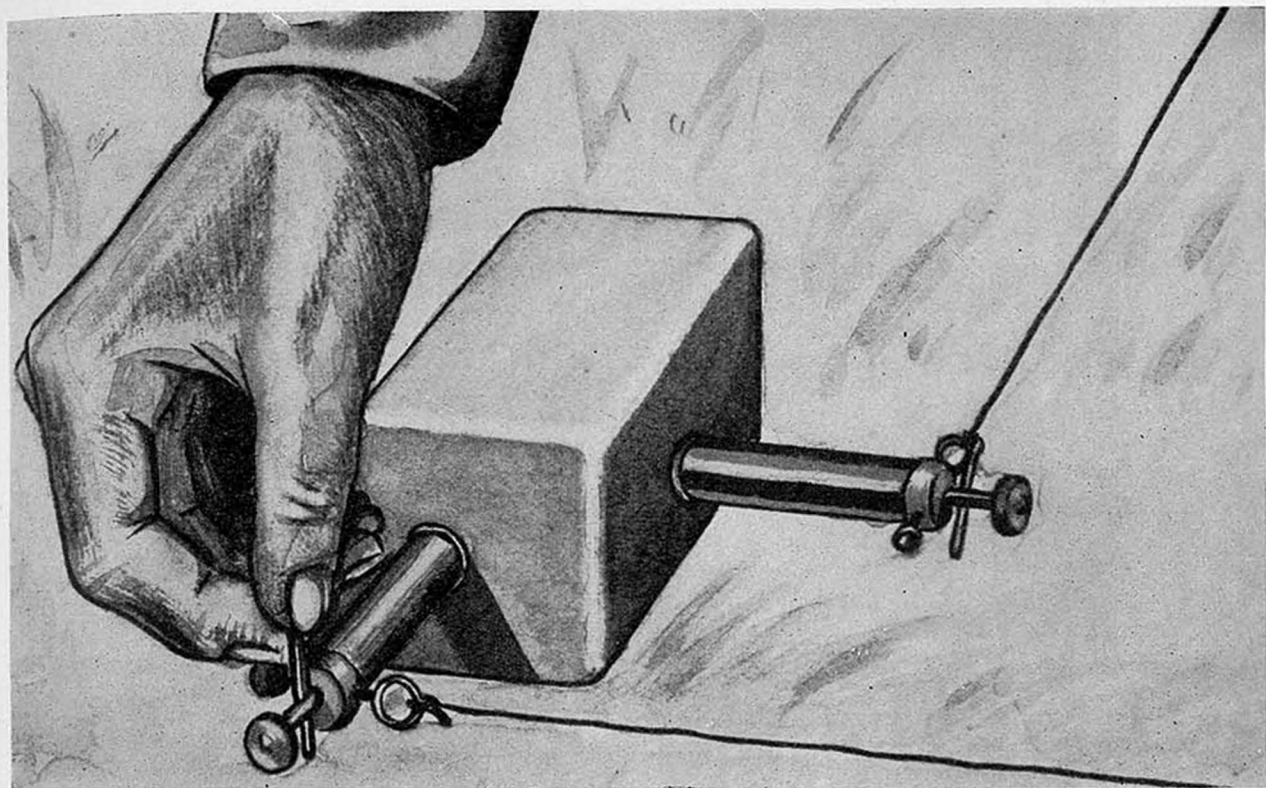
i. The *danger area of a mine* is that area within which fragments of a mine may produce casualties; however, personnel in this area, but

outside the effective casualty radius, are relatively safe.

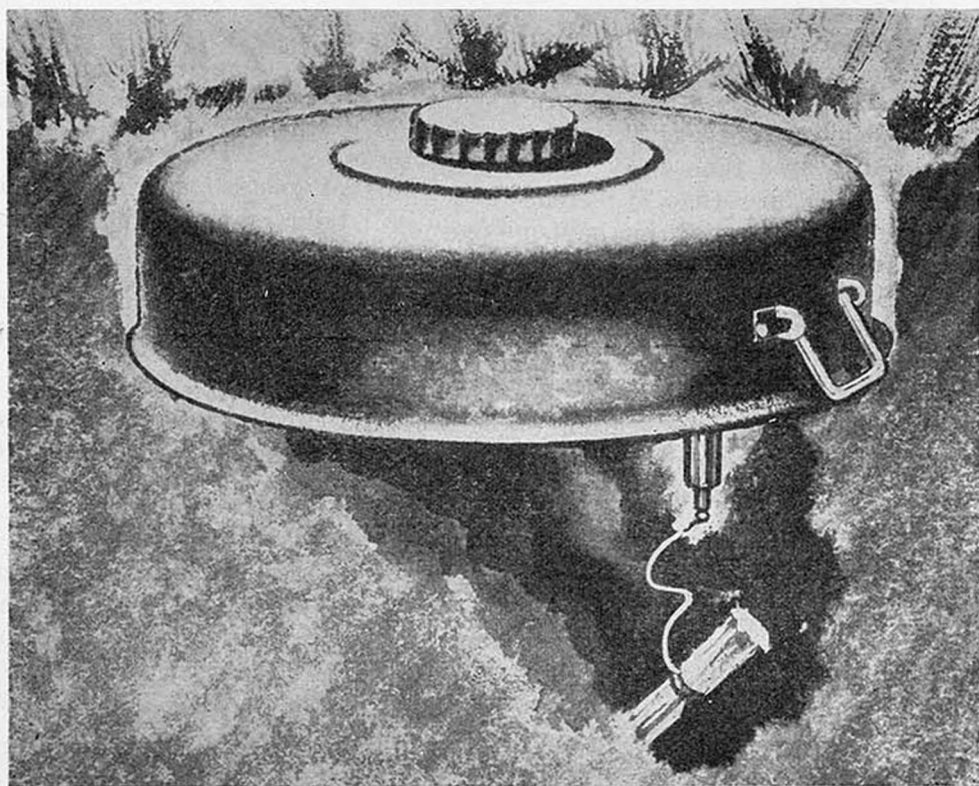
#### 4. Firing Chain of a Mine (fig. 5)

a. *Initiating Action.* Personnel or vehicles, including tanks, initiate the action in the fuze by one of the following methods (fig. 6) :

- (1) *Pressure* on the fuze (fig. 6).
- (2) *Pull* on a pin or pull ring attached to the fuze by means of a trip wire (fig. 6).
- (3) *Pressure release* by removing an object from a compressed spring-actuated lever or plunger (fig. 6).



*Figure 2. Arming a mine.*



*Figure 3. Activated mine.*



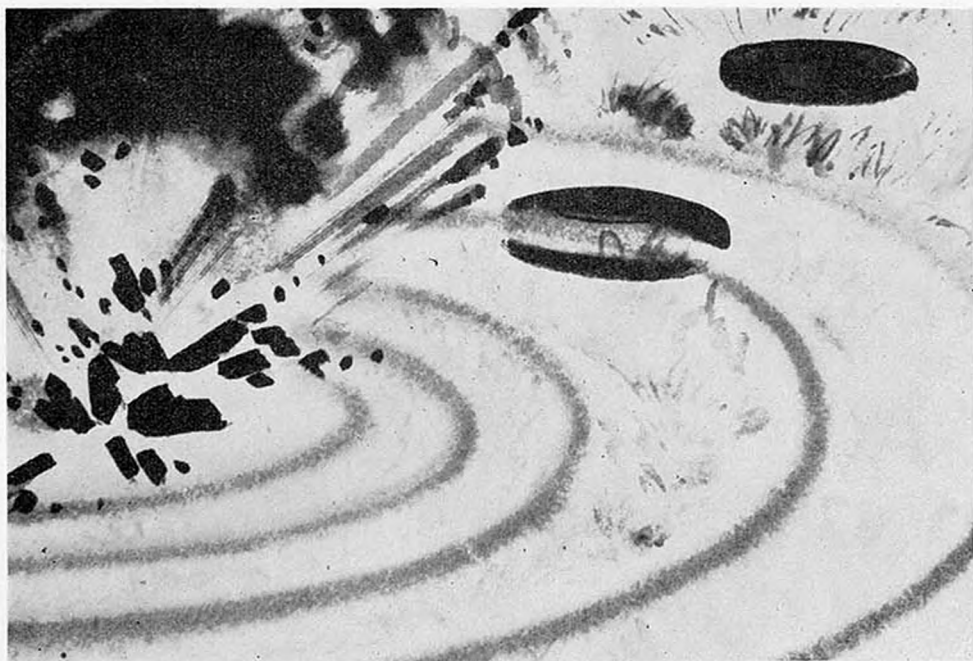


Figure 4. Sympathetic detonation of mines.

- (4) *Tension release* by cutting a taut wire tied to a compressed spring-actuated striker (fig. 6).
  - (5) *Setting delayed-action mechanism* to actuate a fuze. This is normally accomplished by setting a clock mechanism for a desired time delay in the actuation of a fuze (fig. 7). Sometimes this delayed-action mechanism consists of a vial containing a chemical which upon being released corrodes a striker-retaining pin or wire. Another way of obtaining a delayed action is to provide a chemical vial within the fuze. An application of any of the previously mentioned initiating actions will result in the chemical vial being broken. The desired time delay is the time required for the chemical to eat through the striker-retaining pin or wire.
  - (6) *Vibrations* induced by movement in water, air, ground, or structure, where a vibration-contact fuze is laid (fig. 8).
  - (7) *Frequency induction* by:
    - (a) Operating an electric mine detector over a pick-up coil of an induction fuze.
    - (b) Sending radio signals on the same frequency as that of the induction fuze (fig. 9).
  - (8) *Magnetic induction* by moving a metallic mass over a magnetic type fuze (fig. 10).
  - (9) *Breaking a light beam* or otherwise completing an electric circuit (fig. 11).
- b. *Fuze*. The initiating action causes the fuze to function. The fuze, in turn, ignites the detonator by one of the following means:
- (1) *Mechanical*. A percussion cap within the fuze is fired by a mechanically released striker (fig. 6). The percussion cap in turn ignites a detonator. Ignition by friction, as shown in figure 6, is another mechanical method.
  - (2) *Chemical*. A small vial containing acid is broken. The chemical reaction of the acid with the explosive generates



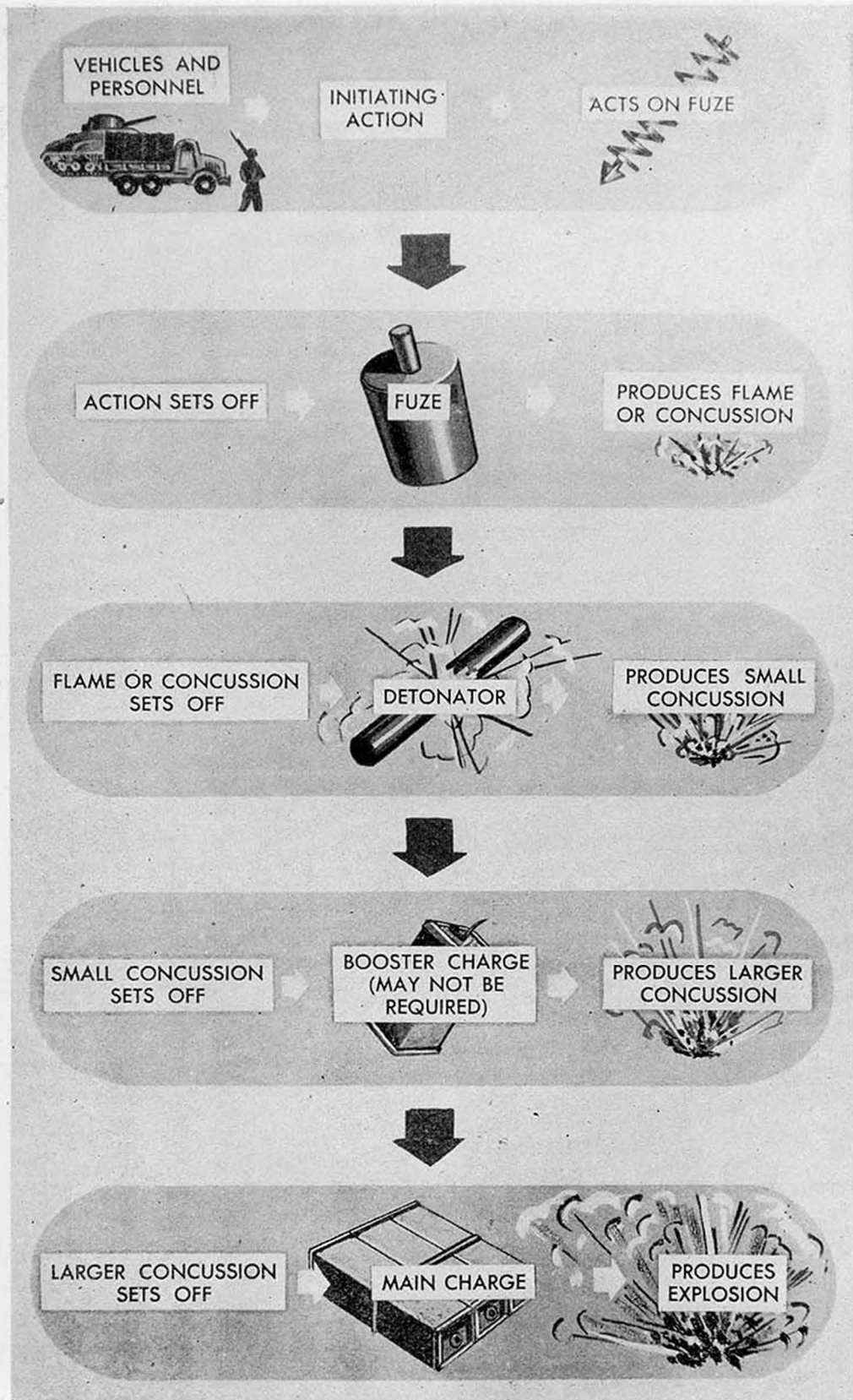


Figure 5. Firing chain of a mine.

## INITIATING ACTION

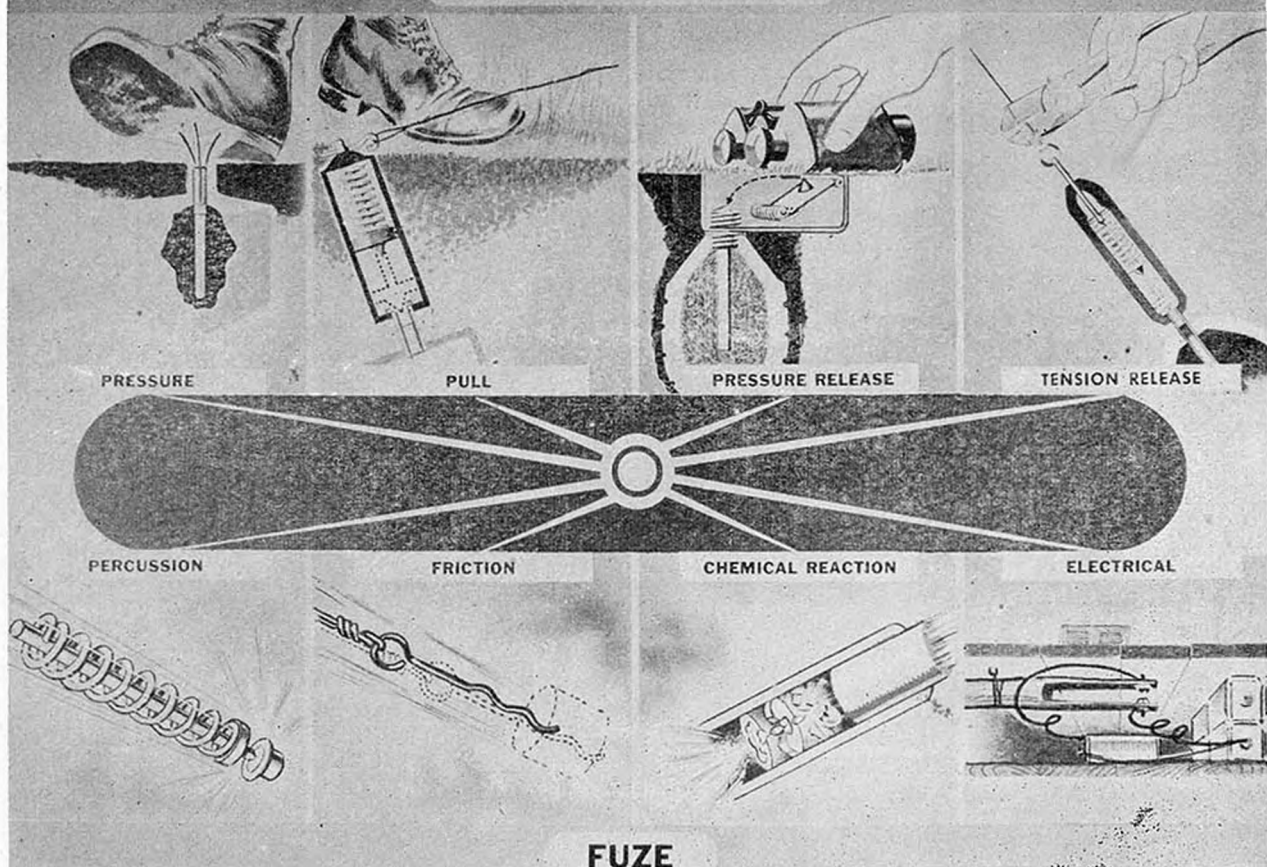


Figure 6. Various initiating actions and fuzes.

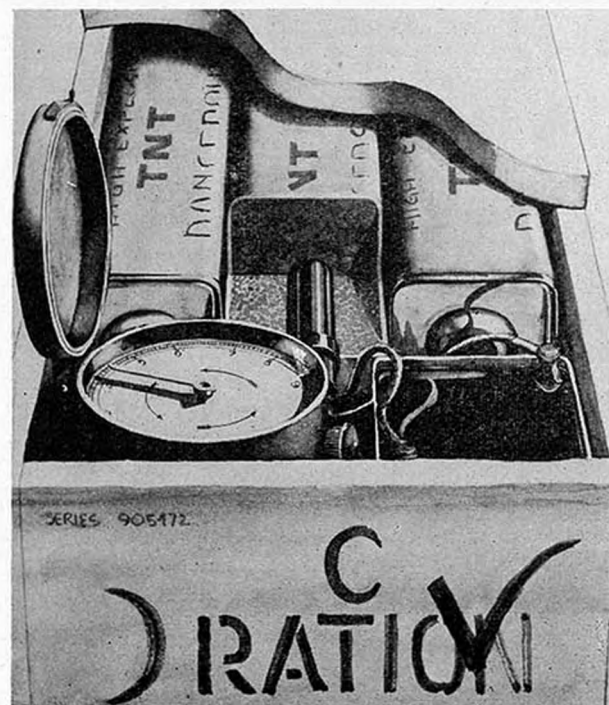


Figure 7. Clockwork delay mechanism.

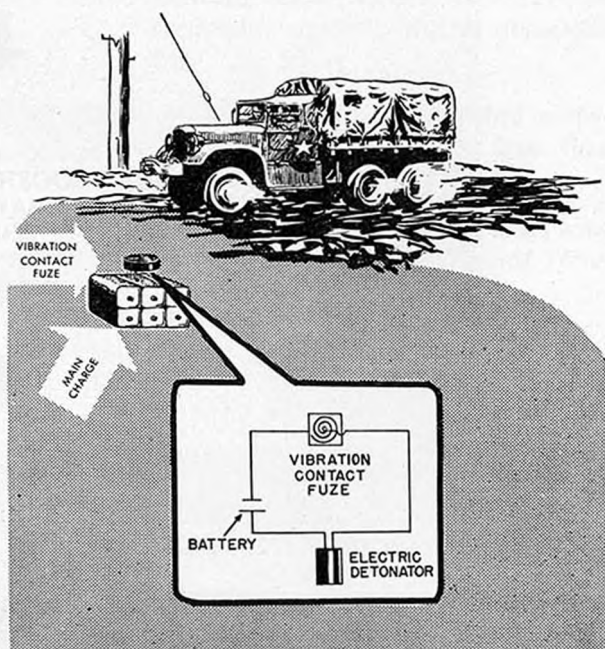


Figure 8. Vibration-contact fuze closes an electrical circuit.



Figure 9. Radio receives signal from transmitter and relays impulse to detonator.



heat which sets off the explosion (fig. 6).

- (3) *Electrical.* The closing of a circuit fires an electric detonator (figs. 6 and 12).
- (4) *Chemical-electrical.* A chemical reaction causes an electric circuit to close.
- (5) *Mechanical-chemical.* A chemical is used to corrode a pin holding a spring-loaded striker. When the pin is sufficiently corroded to break, it releases the spring-loaded striker.

*c. Detonator.* The detonator, a highly sensitive explosive, is set off by the flame or concussion of the fuze (fig. 5).

*d. Booster Charge.* The booster charge consists of a less sensitive but more powerful explosive than that in the detonator and produces an intermediate explosion (fig. 5). A booster charge is not necessary in some mines.

*e. Main Charge.* The main charge, a relatively insensitive explosive surrounding and detonated by the booster charge or detonator, provides the destructive power of the mine (fig. 5).

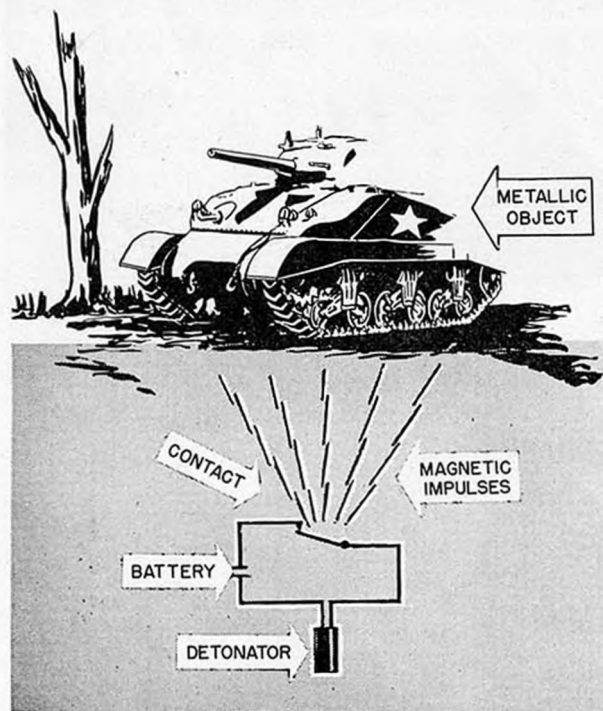


Figure 10. A metallic mass swings a magnetized lever to close a circuit.

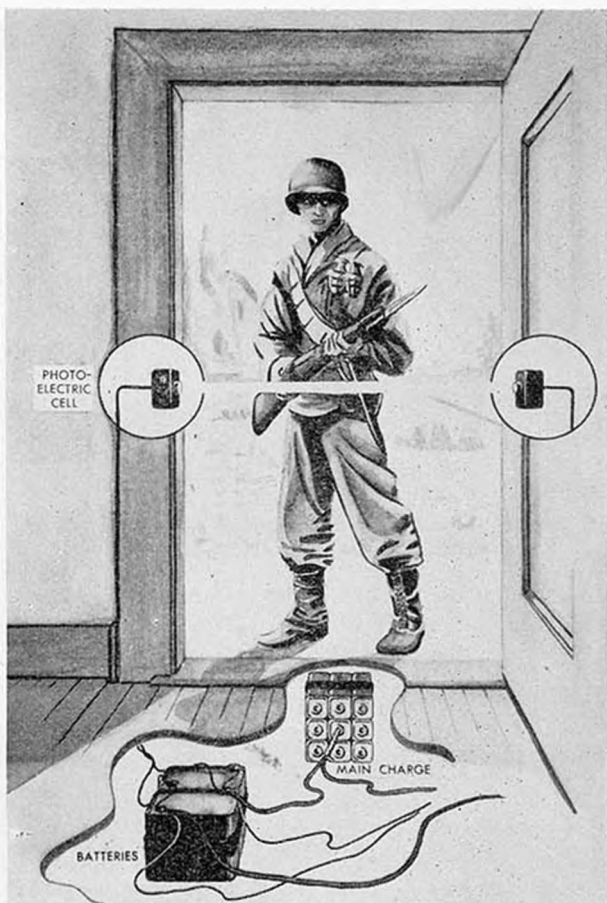


Figure 11. Electric circuit is completed when light beam is broken.

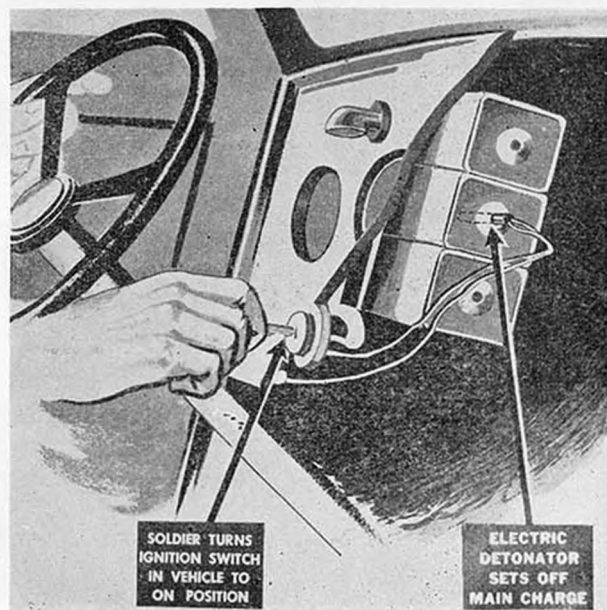


Figure 12. Ignition by electrical means.



## CHAPTER 2

# FOREIGN MINE WARFARE EQUIPMENT

### 5. Types of Mines

*a. Antitank Mines.* Antitank mines are designed primarily for immobilizing tanks. Although all of the major foreign armies have antitank mines, occasionally the amount of explosive in one mine is not sufficient to immobilize a tank. To accomplish the mission two or more mines are sometimes placed together.

*b. Antivehicular Mines.* Antivehicular mines are designed primarily for immobilizing tracked or wheeled vehicles other than tanks. However, two or more of these mines are often placed together to immobilize tanks. All of the major foreign armies employ antivehicular mines. They are referred to as antitransport mines in the Soviet Army.

*c. Dual-Purpose Mines.* Dual-purpose mines are designed both to immobilize vehicles and to produce casualties among personnel. Normally, these mines can be distinguished by the pressure-pull fuze used in them. The fuze is designed to be detonated by vehicles (pressure) and by personnel (pull). Many of the foreign armies use dual-purpose mines.

*d. Antipersonnel Mines.* Antipersonnel mines are used primarily to produce casualties to personnel. They may be placed to protect antitank mine fields and other obstacles, to give local security and warning, or as nuisance mines to harass and delay the enemy. Normally, they are not effective against armored vehicles but may inflict some damage on other vehicles. Antipersonnel mines found in foreign armies are of two general types: shrapnel mines which are designed to injure or kill more than one person and concussion mines designed to kill or injure only the person who steps on or actuates the mine. Antilifting devices and booby traps are classified as antipersonnel mines since they are primarily designed to inflict injuries

upon personnel. All of the major foreign armies employ antipersonnel mines.

- (1) *Antilifting devices.* An antilifting device is a mechanical or a combination mechanical and explosive device designed specifically to cause a mine to detonate when an attempt is made to lift or move the mine (fig. 13). Antilifting devices are primarily designed for an antipersonnel role. Certain types of fuzes, particularly pressure-release fuzes, are in effect antilifting devices as well as booby-trap mechanisms. Some armies, notably the German and Soviet, have produced antilifting devices for the specific purpose of placing them under antitank and antivehicular mines to prevent safe removal of the mines.

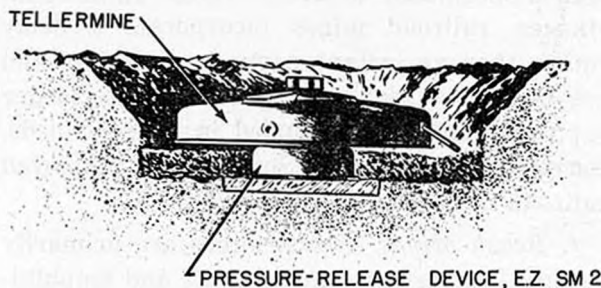


Figure 13. Antilifting device placed under a mine.

- (2) *Booby traps.*

- (a) A booby trap is a mine or charge that is hidden in or attached to an apparently harmless object (fig. 14). The firing mechanism is so placed that an unsuspecting person detonates the hidden mine or charge when he disturbs the object.

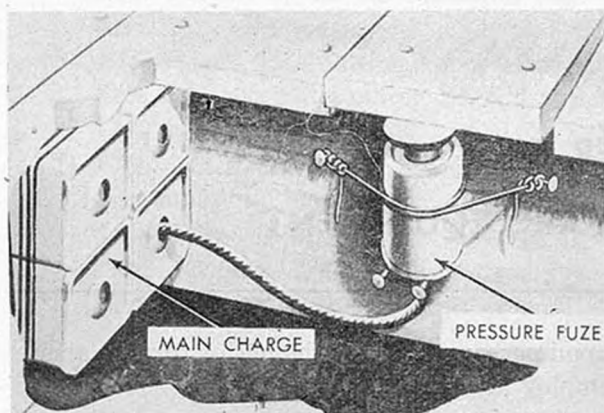


Figure 14. Booby-trap installation.

- (b) Booby traps are especially intended to inflict casualties on and to destroy the morale of opposing forces. They are normally installed during a retrograde movement or during raids or patrols into the positions of the opposing forces. Booby traps may be encountered under any circumstances. They may be found attached to equipment, dead soldiers, and supplies. They may also be installed in abandoned buildings. Ingenuity of installation largely determines their effectiveness.

*e. Railroad Mines.* Railroad mines are designed specifically to wreck trains. In most instances, railroad mines incorporate a delay rather than an instantaneous type of fuze and are used as initial charges to detonate larger supplemental charges buried in railroad beds. Germany, Italy, and the Soviet Union employed railroad mines in World War II.

*f. Beach Mines.* Beach mines are primarily designed to destroy landing craft and amphibious vehicles, to hinder the landing of an opposing force, and to disable vehicles that have landed. They vary greatly in size, explosive content, and type of fuze used. The Japanese, in particular, employed beach type mines in World War II.

*g. River Mines.* River mines are used to destroy floating bridges, fixed bridge piers, and river shipping. They vary considerably in size and explosive content. The usual method of functioning is by the use of pressure or pull

fuzes. Germany and the Soviet Union employed river mines in World War II.

*h. Improvised Mines.* Improvised mines are used when standard mines are unsuitable or unavailable for a particular mission. They are made by filling with an explosive any type of container, such as bottles, crates, sacks, barrels, and tin cans. Improvised mines may also be made of bombs, shells, or grenades and are fitted usually with a pressure or pull fuze. They are extremely dangerous to handle. The Soviet Army places much emphasis on improvised mines.

*i. Dummy Mines.* Dummy mines can be made of any material available. They may be installed in dummy mine fields or may be used to supplement real mines in a live mine field to delay and confuse the enemy by making it necessary for him to consume time in investigating and removing them.

*j. Training Mines.* Mines used in training contain no explosive charges but are similar in construction to standard mines. Various means are available for simulating detonation of the training mines. Training mines are called practice mines in United States mine warfare terminology.

*k. Others.* A number of other types of mines are found in some of the foreign armies but the types listed above are common in most foreign armies and are employed in greater numbers.

## 6. Mine Laying, Marking, and Recording Equipment and Supplies

*a. Mine Laying Devices.* Most armies today rely upon manpower to fuze mines, to prepare holes for them in the ground, and to arm and conceal them. Mine spacing cords and special tools are used by many armies to aid in spacing mines within a mine field and in actually preparing holes for individual mines. Some countries are experimenting with mechanical mine laying devices. The Germans developed a mine laying vehicle in the early part of World War II, but the device proved impracticable.

*b. Mine Marking Equipment.* Mine marking equipment includes all items, such as special tags, flags, and tracing tape, used to mark mine fields and individual mines.

c. *Mine Recording Supplies.* This type of material usually includes special reports, forms, maps, and other pictorial aids used to record the location of mine fields and individual mines.

## 7. Mine Detecting Equipment

Mine detecting equipment includes all devices, such as probes and electronic mine detectors, designed specifically for locating mines. Some countries experimented with substituting

trained dogs for equipment to detect mines, but such practices proved impracticable.

## 8. Mine Clearing Equipment

Mine clearing equipment includes vehicle-mounted devices and manually operated devices. Vehicle-mounted devices are tank-mounted flails, rollers, and drags, and propelled explosive devices. Manually operated mine clearing devices include grapnels, rollers, and explosive charges.



## CHAPTER 3

### NEUTRALIZATION AND REMOVAL OPERATIONS

#### 9. Hand Neutralization of Mines and Fuzes

Troops must know how to neutralize foreign mines and fuzes. Although normally a mine field contains only a few activated mines, during a clearing operation it must be assumed that all mines are activated. Furthermore, troops must be familiar with the types and location of safeties on mines and fuzes. They must also know how to cut the firing chain of a mine to render the mine harmless.

*a. Safeties.* Organic safeties are built into

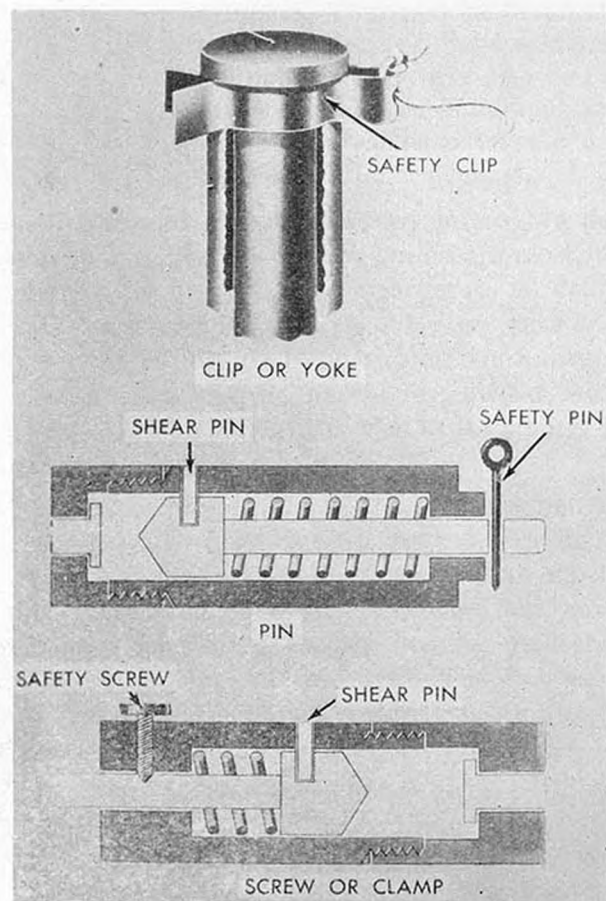


Figure 15. Types of safeties on different fuzes.

practically all mines and fuzes (fig. 15). They are designed to prevent accidental activation.

*b. Cutting the Firing Chain.* A mine is harmless if the firing chain is cut. This is done by cutting any link in the chain, that is, by separating any two of its elements (fig. 16).

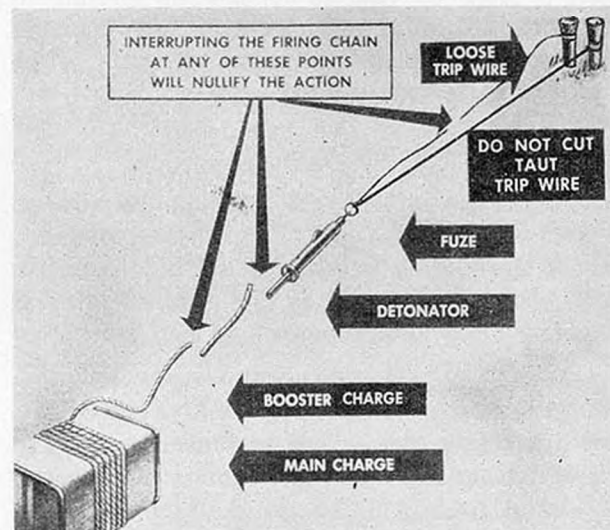


Figure 16. Interrupting the firing chain of a mine.

*c. Steps in Hand-Neutralizing.* The steps in hand neutralizing a buried mine are as follows:

- (1) Carefully probe to locate the mine exactly.
- (2) Carefully search around and under the mine, locating and neutralizing all secondary fuzes.
- (3) Neutralize the mine by making the main fuze safe. Some foreign mines contain fuzes that cannot be made safe in any way. These mines should be neutralized by destroying them in place with a prepared charge.

#### 10. Removal of Mines

*a.* The following general rules should be applied when removing foreign mines.



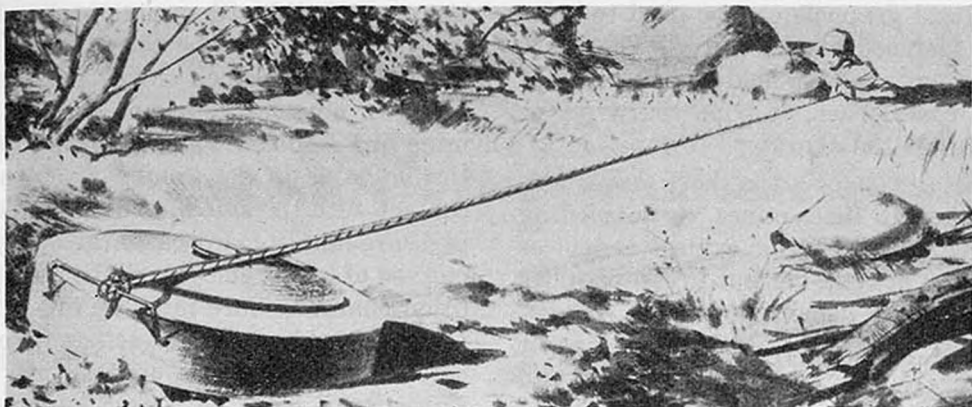


Figure 17. Removing a mine by rope from a safe distance of 50 yards.

- (1) Handle all mines and fuzes with care at all times.
- (2) Use only one man to work on a mine.
- (3) Carefully examine the ground around a mine before starting to work on it.
- (4) Constantly be on the lookout for booby traps.
- (5) Prior to lifting a mine, neutralize all fuzes and cut any *slack* trip wires.
- (6) Never cut a taut wire; never pull a slack one. Look at *both* ends of a wire before you touch it.
- (7) When detonation of a mine in place is objectionable pull the mine clear with 50 yards of rope or signal cable.
- (8) Take cover before pulling a mine, and do not come out for at least 10 seconds after pulling it. There may be a delay fuze. Examine the covered position for booby traps before occupying it.
- (9) Never use force on a mine or booby trap. If a part cannot be removed without applying an undue amount of force, stop removal.
- (10) If a mine or booby trap must be left unlifted, mark the location prominently.
- (11) Neutralize antipersonnel mines by replacing all safety pins before lifting them.
- (12) When walking in a mined area, keep looking at the ground immediately ahead.
- (13) When cutting the wires of an electrical detonator cut them one at a time.

b. Mines can be removed by occupying a defiladed position and pulling them out with a long

rope (fig. 17) or signal wire. If no defilade is at hand, a safe pulling distance is at least 50 yards. With this method, always remain in a prone position. Activated mines are normally detonated in this manner.

c. Mines can be neutralized by destroying them in place with hand-placed charges. The charges are placed on or beside the mines to be destroyed (fig. 18). The mines themselves are not handled.



Figure 18. Placement of charge on mines to be destroyed in place.

d. Improvised grapnels can be used to actuate charges fastened to trip wires. The grapnel is thrown out over the field and then pulled back. As it comes back, it trips the wires or cords, setting off the charge.

e. Mechanical and blast methods have been developed to neutralize mines by exploding them. Such mechanical and explosive devices are the scorpion or flail, various pressure-roller devices, the various demolition snakes, bangalore torpedoes, and explosive mats or carpet rolls.

f. In World War II, both the Germans and the Soviets employed artillery to clear gaps through known mine fields. Some countries have experimented with area bombing by aircraft to clear gaps through mine fields.

g. Wooden and cardboard mines that have been buried for long periods are dangerous to remove. Experience has shown that mines composed of wood or cardboard will deteriorate rapidly under humid or damp-soil conditions. If a wooden mine is subjected to alternate periods of dampness and dryness, the mine will undergo serious deformation resulting in large cracks which will permit the entrance of soil moisture into the explosive chamber. In some wooden and cardboard mines the explosive filler hole is sealed with tar. This tar will develop cracks after continuous exposure. Wooden pressure lids that contain grooves to assist actuation will rot in the grooves and will detonate more readily when pressure is applied on

the pressure lid with a mine probe. Mine clearing personnel must be cautioned in the use of the mine probe when the mines are known to be in an advanced state of deterioration. The mine probe should be held at the smallest practicable angle to the ground so as to come into contact with the side of the mine instead of the pressure lid. In many cases the only practicable method of mine removal will be the use of demolition charges. Care must be taken to see that all personnel have been evacuated from the area before any demolition charges are detonated. Entire mine fields have been known to explode from sympathetic detonation. Mine fields containing deteriorating wooden and cardboard mines are particularly susceptible to sympathetic detonation.

h. Metallic mines that have been buried for long periods of time are dangerous to remove. They will rust to such an extent that it becomes almost impossible to detect their location with the mine detector. In general, mines of metallic construction which use waterproof seals will withstand the action of soil moisture better than wooden or cardboard mines. Eventually, however, the mine body will rust and the explosive will become contaminated.

i. Some types of fuzes become extremely sensitive when they are exposed to soil moisture. These types should be removed by placing demolition charges or using tank rollers and other devices which will permit the removal of the mines without undue exposure of personnel.

# PART TWO. GERMAN MINE WARFARE EQUIPMENT

## CHAPTER 4

### INTRODUCTION TO GERMAN MINE WARFARE EQUIPMENT

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#### 11. General

The Germans employed more mines in World War II than did any other country, with the possible exception of the Soviets. In addition to developing its own mine warfare equipment, the German Army improved upon and adopted equipment of the armies of other countries during World War II. German fuzes copied from Soviet fuzes (TM 5-223A) include the pull fuze 42 (Z.Z. 42) copied from the Soviet MUV pull fuze; the chemical-mechanical time delay fuze 41W (C.M.Z. 41W) copied from the Soviet EKhV chemical-electrical delay fuze; and the SM-12 frequency-induction fuze. German mines which were copied after the Soviet mines are the concrete stake mine, an antipersonnel mine patterned after the Soviet POMZ-2 shrapnel mine, and the Schü'mines, which were patterned after the Soviet PMD wooden box mines. The Germans also incorporated features of the Soviet Ovtsinnikov mine and the British ointment-box mine when they developed the 400-gram Schü'mine. The German Army also adopted the Finnish ice mine (TM 5-223B).

#### 12. Scope and Source of Data

Part two of this manual covers the description, employment, functioning, installing, arming, and neutralizing of individual German fuzes and mines. It also describes miscellaneous mines, mine detectors, and various items of mine warfare equipment, such as remote-controlled mine detonating equipment and mine probes. Although not outlined in installing and arming procedures camouflage will be accomplished at all times. The major portion of the data presented here on German mine warfare equipment is based on captured documents, intelligence reports, and information obtained through liaison with other allied forces during World War II. Wherever possible, information in this manual is based on actual pieces of equipment. It is requested that any reader possessing information that modifies the data contained in this manual, or who encounters mine warfare equipment not discussed herein, forward such information to—

Assistant Chief of Staff, G-2

Washington 25, D. C.

or

Chief of Engineers

Washington 25, D. C.

ATTN: Engineer Intelligence Division



## CHAPTER 5

### FUZES

#### Section I. INTRODUCTION

##### 13. General

The German Army developed and employed more mine fuzes than any other army in the world. Twenty-three of the 36 standard mines employed by the Germans in World War II used specifically designed fuzes. Twenty-eight fuzes were designed especially for use in mines. In addition, the Germans had at least 15 models of fuse lighters and grenade fuzes, 12 models of fuzes designed for the detonation of large charges but occasionally used with mines, and two remote-control detonating devices. Because of the large number and variety of German fuzes, this manual discusses each type of fuze in a separate section according to the initiating action necessary to start the fuze functioning (par. 4). Mechanical, electrical, and chemical fuzes are discussed in that order within each section.

##### 14. Status of Fuze Development at the End of World War II

At the end of World War II the Germans

were experimenting with, or had produced, non-battle-tested mine fuzes of types differing from those that had already been employed in battle. Some of these types are—

##### a. Friction-Pressure Fuze (*Bossezünder*).

This type fuze consisted of a chemical mixture (potassium chlorate and sand with about 2 percent phosphorous and alcohol) contained in an aluminum cap pressed over a plastic case. A No. 8 nonelectric detonator fits in the threaded base of the case. The fuze was designed for use in improvised pressure mines.

b. *Induction Fuzes*. Induction fuzes are designed to close electric circuits after receiving magnetic impulses, radio signals, vibrations, or electronic impulses. Models of all the foregoing types of induction fuzes had been employed in combat by the Soviets with varying degrees of success. The Germans had never employed any of their models in combat, as far as is known.

#### Section II. PRESSURE FUZES

##### 15. Tellermine Fuze 35 (*Tellerminen-zünder 35; T.Mi.Z. 35*)

a. *Description*. The Tellermine fuze 35 (fig. 19) is an instantaneous, mechanical type. It has a diameter of  $1\frac{5}{8}$  inches and a height of  $2\frac{1}{8}$  inches. It consists of a cylindrical brass case containing a spring-loaded striker held by a shear pin to a cylindrical housing which is loosely retained in the fuze case by a threaded

collar. A percussion cap is screwed into the base of the striker housing. The base of the fuze case is threaded to screw into the fuze well in the pressure plate of the Tellermine 35 (par. 62). The fuze has two safety devices:

- (1) A horizontal safety bolt which passes through a hole in the striker and prevents shearing of the shear pin. In the armed position the safety bolt is pulled out by a safety-bolt claw.





- (2) A rod, attached to a slotted screw head on the arming dial in the top of the fuze, with a cam at the lower end. When the screw head is turned to *sicher* (safe), the cam engages the striker and takes the pressure of the striker spring off the shearpin. When the arming dial is set at *scharf* (armed), the cam is disengaged from the striker.

b. *Employment.* This fuze was designed especially for use in the Tellermine 35.

c. *Functioning.* Pressure of about 400 pounds on the top of the fuze case or depression of the pressure plate of the mine presses the top of the fuze case onto the end of the striker until the shear pin shears, releasing the striker against the percussion cap firing the detonator.

d. *Installing and Arming.*

- (1) Screw the fuze into the fuze well of the mine.
- (2) Turn the screw-head on the arming dial in the top of the fuze so the red dot points to *scharf* (armed).
- (3) Pull the safety bolt out by the wire attached to the safety-bolt claw.

e. *Neutralizing.*

- (1) Press in the safety bolt and turn the screw-head arming dial in the top of the fuze so the red dot points to *sicher* (safe).
- (2) Unscrew the fuze from the mine.

f. *Packing.* Six fuzes are packed in a tin box with a descriptive label pasted on the lid. A special wrench for fitting the fuze into the mine is also packed in the box with the fuzes.

## 16. Tellermine Fuze 42 (Tellerminen-zünder 42; T.Mi.Z. 42)

a. *Description.* The Tellermine fuze 42 (fig. 20) is an instantaneous, mechanical type. It consists of a cylindrical steel case containing a spring-loaded striker held by a shear pin through the end of the striker shaft, flush with the top of the fuze case. A percussion cap is built into the base of the fuze. The percussion-cap holder is threaded to receive the detonator. The fuze is 2 inches high and  $\frac{7}{8}$  of an inch in diameter.

b. *Employment.* The Tellermine fuze 42 is used in the Tellermines 35 (steel), 42, and 43.

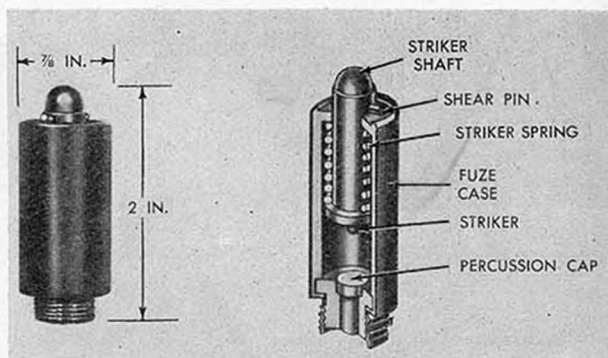


Figure 20. Tellermine fuze 42.

c. *Functioning.* A pressure of about 495 pounds on the end of the striker shaft shears the shear pin and releases the spring-loaded striker against the percussion cap firing the detonator.

d. *Installing and Arming.* Screw the detonator-retaining collar, with the detonator, to the base of the fuze. The fuze has no safeties and is armed once the detonator is attached.

e. *Neutralizing.* Unscrew the detonator-retaining collar from the base of the fuze and remove the detonator.

f. *Packing.* Six fuzes, with detonators attached, are packed in a long cardboard box with a descriptive label pasted on the lid.

## 17. Snap Fuzes

These fuzes are called snap fuzes because the shear strip or shear rod snaps when pressure is exerted on it. Snap fuzes were designed to detonate antitank mines in deep snow where the ordinary type of pressure fuze would be ineffective because of the inability of snow to support a mine when pressure is exerted upon it. The fuze also was used in antitank mines laid in grassy or bushy areas to insure detonation of mines lying between the two tracks of tanks. Normally, only a few mines in a mine field were fitted with this type of fuze. The Germans developed four models of snap fuzes (pars. 18, 19, 20, and 21).

## 18. Snap Fuze 43/I (Knickzünder 43/I; Kn.Z. 43/I)

a. *Description.* The snap fuze 43/I (fig. 21) is an instantaneous, mechanical type about 35 inches long with the extension rod screwed on.

It has a spring-loaded striker with a shear-strip release, an extension rod, and a fuze case. The fuze can be screwed into any fuze well having standard threads. The extension rod, which consists of five sections of tube inside a metal sheath, contains a chain made up of metal hooks. The bottom hook of the chain is attached to a flat metal shear strip, the lower end of which is held to the hollow striker sleeve by a metal striker-sleeve pin. The upper end of the chain is threaded and passes through the top of the chain housing. The chain is held to the extension rod by two retaining nuts. A cylindrical safety pin prevents the shear strip from moving. One end of the safety pin has a safety-pin-removal wire attached to remove the pin from the fuze. The other end has a safety-pin-retaining wire attached to prevent accidental removal of the safety pin.

*b. Employment.* This fuze is used in anti-tank mines buried in the ground or under snow. The extension rod of the fuze is camouflaged as a seedling or clump of high grass.

*c. Functioning.*

- (1) A sideward pressure exerted on the extension rod bends it, causing the chain to pull the shear strip upward.
- (2) This action raises the shear strip, the striker sleeve, the striker-sleeve pin, and the striker, compressing the striker spring until the buffer is reached.
- (3) Further pressure shears the shear strip at the shear groove releasing the spring-loaded striker.
- (4) The striker fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Carefully stake the mine down to prevent the mine from tilting when the extension rod is bent.
- (2) Insert the detonator into the fuze.
- (3) Screw the fuze into the mine.
- (4) Remove the safety-pin-retaining wire.
- (5) Remove the safety pin by means of the attached safety-pin-removal wire.

*e. Neutralizing.* Do not move the extension rod. The fuze may have been partially broken or subject to blast, and any movement might cause detonation of the mine.

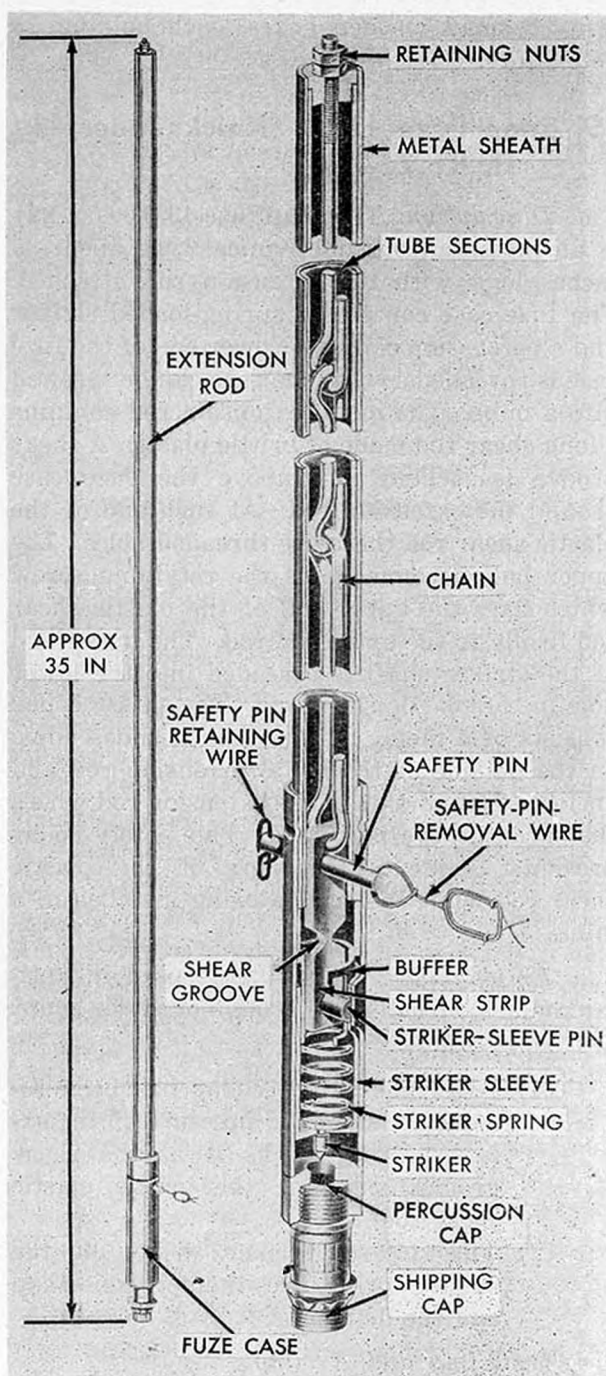


Figure 21. Snap fuze 43/I.

- (1) Replace the safety pin, using the original pin, a nail, or a heavy wire, and fix it firmly to the fuze by wiring it in place.
- (2) Unscrew the fuze from the mine.
- (3) Remove the detonator.

*f. Packing.* Seventy-five fuzes, in bundles of 15, are packed in a wooden box which also con-



tains 5 small wooden boxes, each holding 15 detonators.

## 19. Snap Fuze 43/II (Knickzünder 43/II; Kn.Z. 43/II)

*a. Description.* The snap fuze 43/II (fig. 22) is an instantaneous, mechanical type about 35 inches long with the extension rod attached. The fuze case contains a spring-loaded striker and a percussion cap. The lower end of the fuze case is threaded so that the fuze can be screwed into a mine. The metal extension rod contains a long shear rod made of brittle plastic. A shear groove is located just above the fuze case around the extension rod. At each end of the plastic shear rod there are threaded holes. The upper hole accommodates the retaining screw which fixes the upper end of the plastic shear rod firmly to the extension rod. The upper end of the striker shaft is threaded into the lower hole in the plastic shear rod. The safety collar consists of a metal cylinder which slides down on the outside of the metal extension rod and encloses that portion of the extension rod where the shear groove is located. This safety collar prevents accidental shearing of the plastic shear rod while the fuze is being installed in a mine.

*b. Employment.* This fuze is used in anti-tank mines buried in the ground or under snow.

### *c. Functioning.*

- (1) After the safety collar has been removed, a sideward pressure on the extension rod breaks it at the shear groove, snapping the brittle plastic shear rod.
- (2) The released striker, driven by the striker spring, fires the percussion cap and the detonator.

### *d. Installing and Arming.*

- (1) Carefully stake the mine down so that it will not tilt when pressure is applied to the extension rod.
- (2) Unscrew the percussion-cap assembly and replace it with a percussion-cap-and-detonator assembly (Zünder-sprengkapsel 43). If the entire percussion-cap assembly cannot be replaced, insert a detonator into the base.

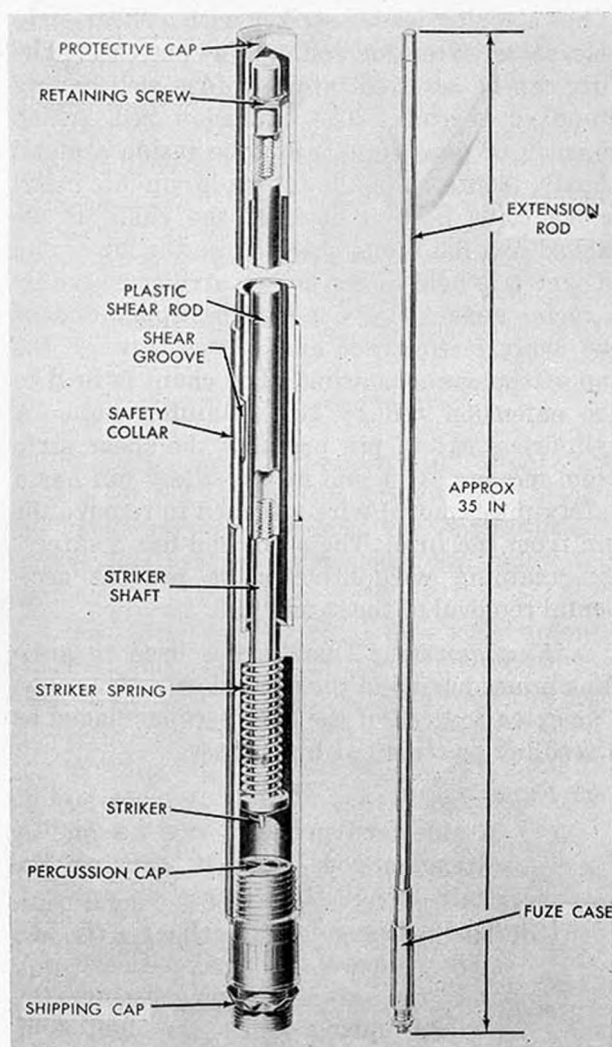


Figure 22. Snap fuze 43/II.

- (3) Remove the shipping cap and screw the fuze into a mine.
- (4) Remove the safety collar by sliding it upward and off the extension rod.

### *e. Neutralizing.*

- (1) A mine using this fuze should be detonated in place since the only safety device is the safety collar, which will probably not be available. Improvised safety devices are difficult to construct.
- (2) If necessary, this fuze may be unscrewed from the mine, providing extreme care is taken *not* to place any sideward pressure on the extension rod. When unscrewing the fuze from the mine, grasp the lower part of the fuze case.

## 20. Snap Fuze 43 (Short) (Knickzünder 43 (Kurtz); Kn.Z. 43)

a. *Description.* The snap fuze 43 (short) (fig. 23) is an instantaneous, mechanical type having a spring-loaded striker with a shear release. The principle of operation of this fuze is similar to that of the snap fuze 43/II (par. 19) except that the plastic shear rod is not used and the striker has a larger diameter. A shear groove is cut into the striker shaft and the fuze case. The fuze is approximately 3 inches long and  $\frac{7}{8}$  of an inch in diameter.

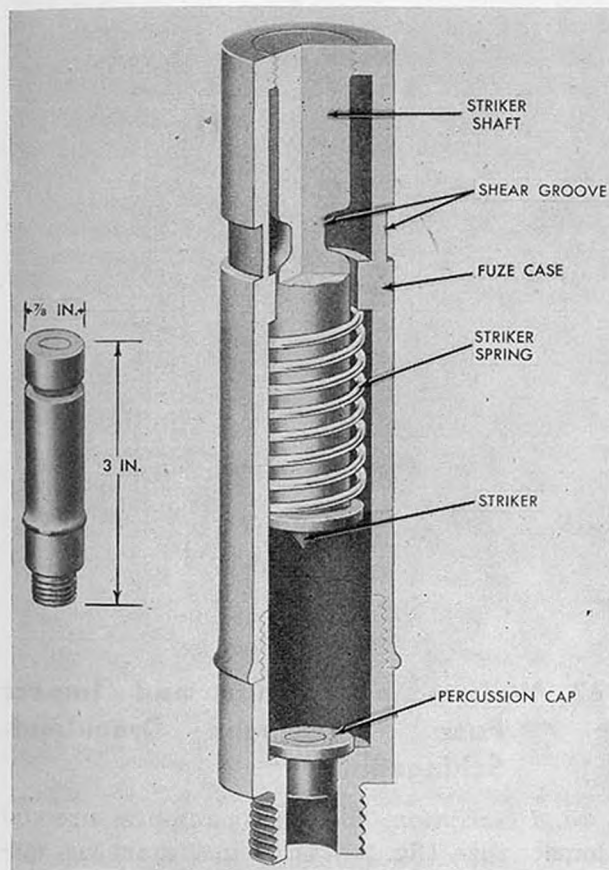


Figure 23. Snap fuze 43 (short).

b. *Employment.* This fuze was designed late in World War II to replace the pull fuze 42 (par. 42) in the bar mine 43 (par. 66).

### c. *Functioning.*

- (1) A pressure of at least 150 pounds in the shear groove, or on the side of the fuze case above the shear groove, snaps the fuze case at the shear groove.

- (2) The pressure then bends the striker shaft and shears it off at its shear groove, releasing the spring-loaded striker against the percussion cap firing the detonator.

### d. *Installing and Arming.*

- (1) Insert the detonator in the fuze.
- (2) Screw the fuze into the mine.

### e. *Neutralizing.*

- (1) Unscrew the fuze from the mine.
- (2) Remove the detonator from the fuze.

## 21. Snap Fuze 43 (Waterproof) (Knickzünder 43 (Wasserdicht); Kn.Z. 43)

a. *Description.* The snap fuze 43 (waterproof) (fig. 24) is an instantaneous, mechanical type similar to the snap fuze 43/I (par. 18) in operation. It is approximately 39 inches long. The fuze case contains a spring-loaded striker and a striker shaft provided with a slotted end to receive a shear strip. The shear strip is provided with a shear groove and is held within the slot in the striker shaft by a pin. Near the top of the shear strip is a large hole through which the safety pin is inserted. Above the safety-pin hole is a smaller hole where the hooked end of the pull rod is inserted. The extension rod is composed of six segments of tubing held at each joint by metal rings and collars. The pull rod is held to the top of the extension rod by a threaded nut. The entire fuze is completely covered by a waterproof material.

b. *Employment.* This fuze is used in anti-tank mines buried in the ground or under snow. It may also be used with waterproof mines as an antiboat obstacle.

c. *Functioning.* Pressure exerted against the extension rod bends the rod at one of the joints, causing the pull rod to pull up on the shear strip and the striker assembly. This compresses the striker spring between the retaining washer and striker collar exerting a severe strain on the shear strip until the strip snaps at the shear point, releasing the spring-loaded striker. The released striker sets off the percussion cap and the detonator.

### d. *Installing and Arming.*

- (1) Carefully stake the mine down so that

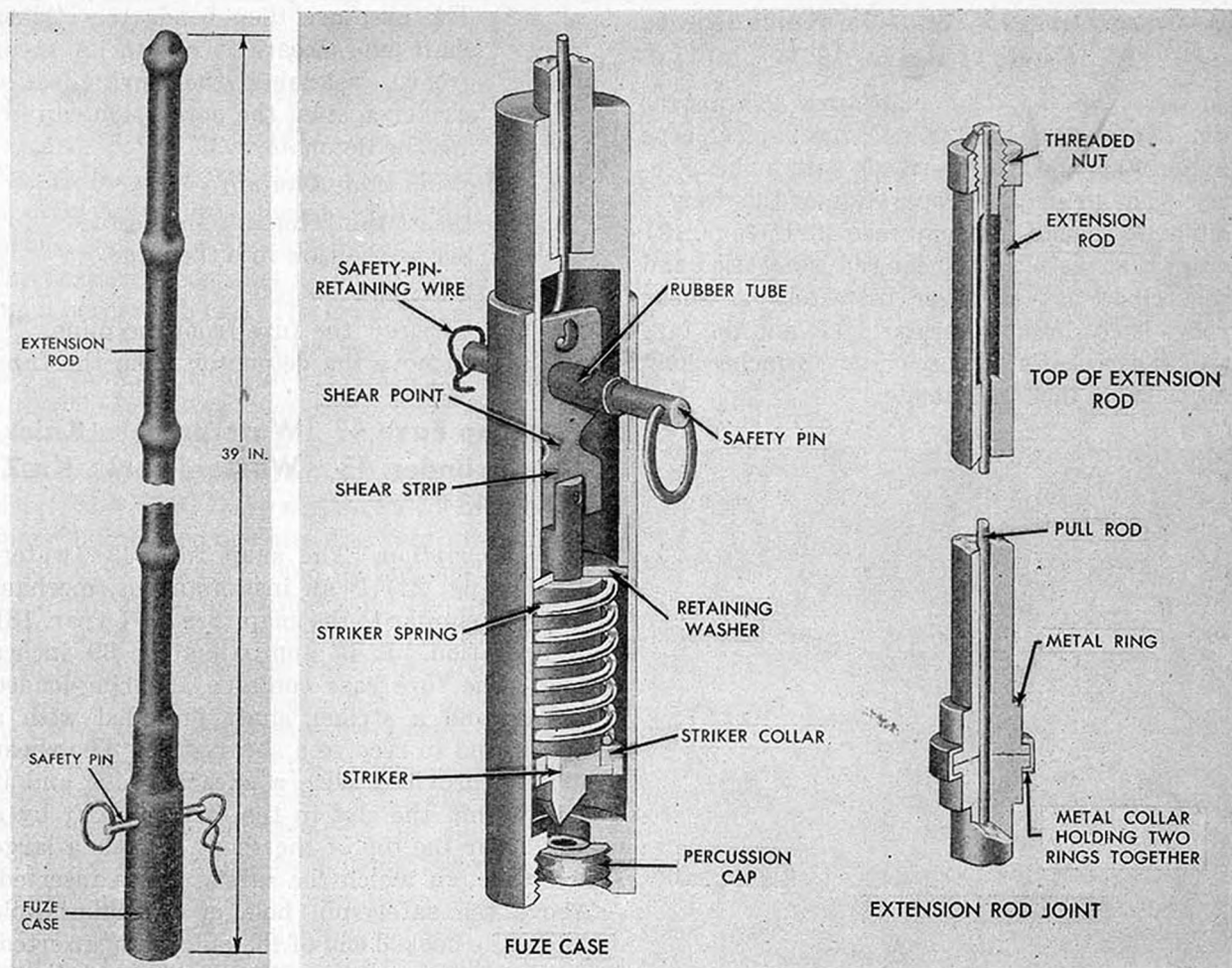


Figure 24. Snap fuze 43 (waterproof).

it will not tilt when pressure is applied to the extension rod.

- (2) Screw a percussion-cap-and-detonator assembly (Zündersprengkapsel 43) into the base of the fuze.
- (3) Screw the fuze into the mine.
- (4) Remove the safety-pin-retaining wire and the safety pin. The rubber tube around the safety pin should remain in the fuze case.

*e. Neutralizing.*

- (1) Insert a nail or wire into the safety-pin hole and fasten it securely in place.
- (2) Unscrew the fuze from the mine.
- (3) Unscrew the percussion-cap-and-detonator assembly from the fuze.

## 22. Weissmann Pressure and Impact Fuze (Weissmann Druck-und-Schlagzünder)

*a. Description.* The Weissmann pressure and impact fuze (fig. 25) is an instantaneous, mechanical type. The spring-loaded striker with a circular, metal pressure head is held in a cocked position by a glass rod. This glass rod passes through the striker shaft at right angles to, and between, the safety-pin holes. The safety pin is shaped like a pair of tongs and is held in place by a spring clip. The percussion-cap-and-detonator assembly is inserted into the base of the fuze. A metal clamp holds the fuze to the main charge. Without the metal clamp, the fuze is  $2\frac{3}{8}$  inches high and  $\frac{1}{2}$  inch in diameter. The pressure head is 1 inch in diameter.



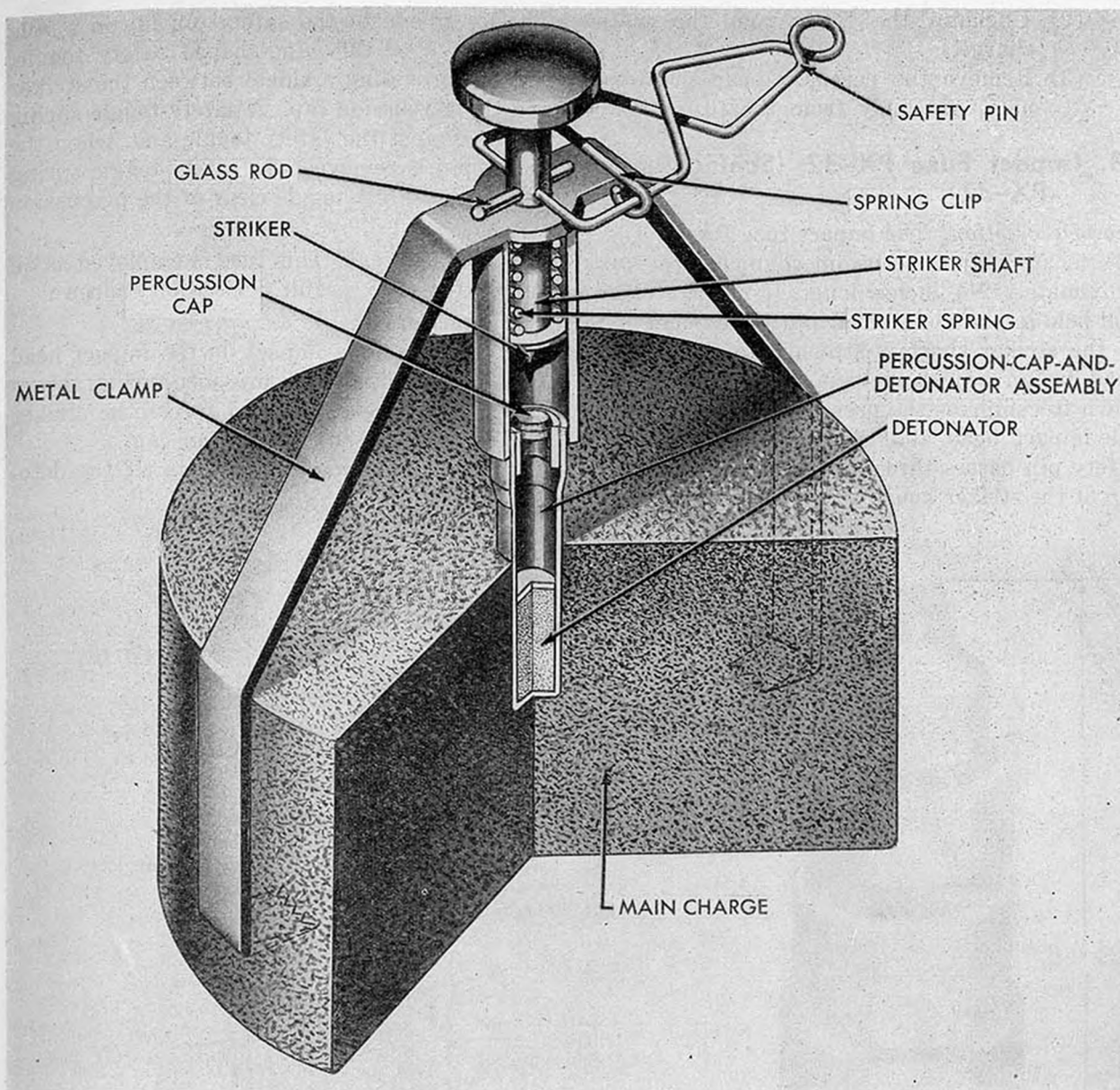


Figure 25. Weissmann pressure and impact fuze.

*b. Employment.* This fuze was designed to be used either as a pressure fuze in improvised mines or as an impact fuze with prepared charges in an assault on a fortified position.

*c. Functioning.* After the safety pin has been removed, impact or pressure on the pressure head breaks the glass rod, releasing the striker against the percussion cap, firing the detonator and the main charge.

*d. Installing and Arming.*

- (1) Insert the percussion-cap-and-detector assembly in the bottom of the fuze.

- (2) Clamp the fuze to the main charge with the metal clamp.

- (3) Remove the safety pin from the fuze.

*e. Neutralizing.*

- (1) Inspect the glass rod to see if it has been cracked or damaged. If it is cracked, do not attempt to neutralize the fuze, but destroy it in place with a prepared charge. If the glass rod is not cracked, carefully insert both ends of a wire or other suitable safety pin in both ends of the safety-pin hole.

- (2) Unclamp the fuze from the main charge.
- (3) Remove the percussion-cap-and-detonator assembly from the fuze.

### 23. Impact Fuze PX-32 (Schlagzünder PX-32)

*a. Description.* The impact fuze PX-32 (fig. 26) is an instantaneous, mechanical type approximately 2 1/4 inches long. It has a striker bolt held in place by a shear pin. The upper end of the striker shaft is attached to the impact head by an adjusting vane which is screwed down to compress the pressure spring between the impact head and the striker housing. A safety pin passes through the gap between the top of the striker housing and the impact head.

The lower end of the safety pin fits in a hole in one end of the wing-shaped safety toggle, thereby providing a shield between the striker and the percussion cap. A safety-toggle spring forces against the safety toggle and, when the safety pin is removed, the safety-toggle spring pushes the safety toggle clear of the percussion cap.

*b. Employment.* This fuze is employed as an impact fuze for assault demolition charges.

*c. Functioning.*

- (1) A sudden impact on the impact head compresses the pressure spring, shears the shear pin, and forces the striker against the percussion cap.
- (2) The percussion cap sets off the detonator.

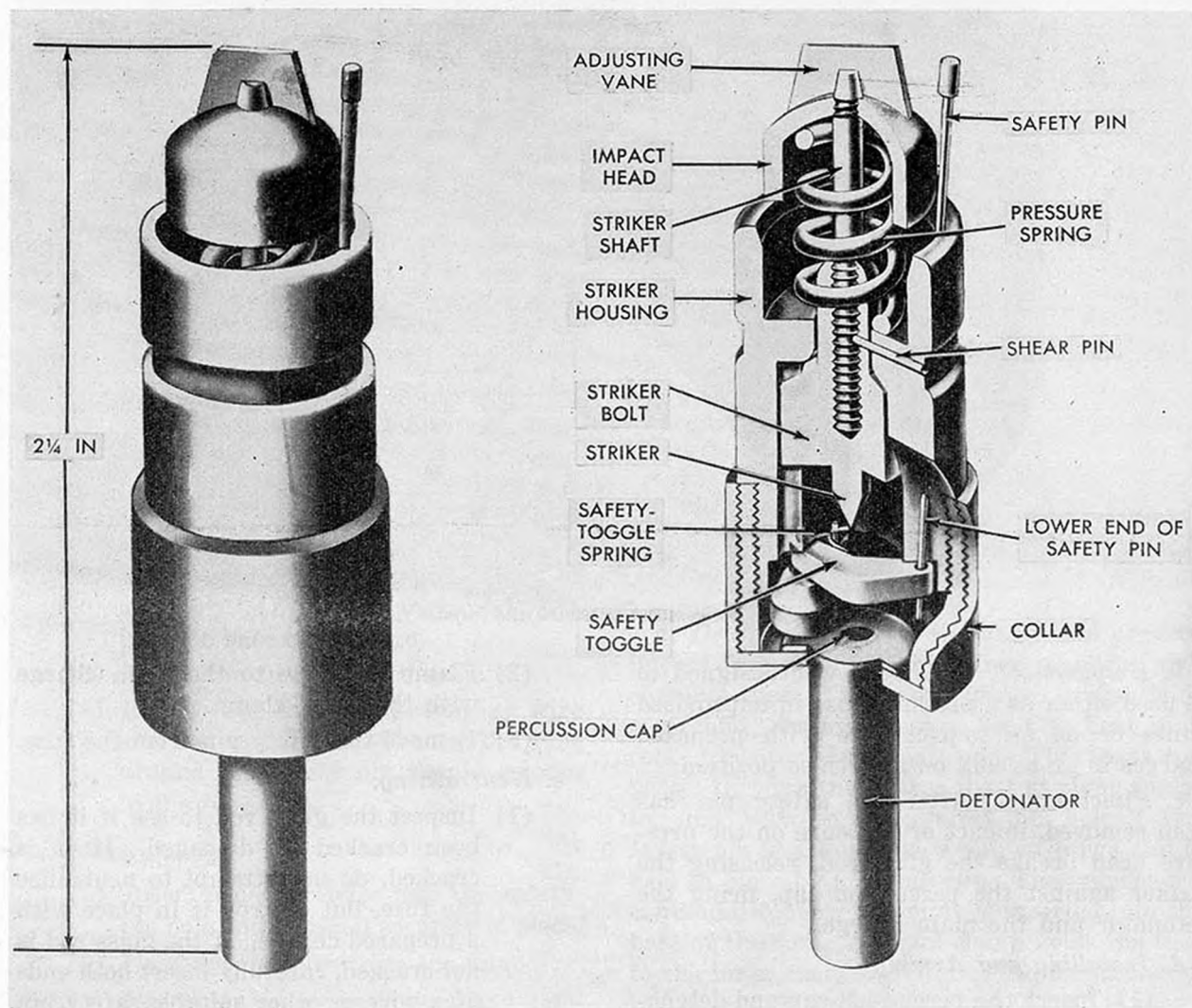


Figure 26. Impact fuze PX-32.

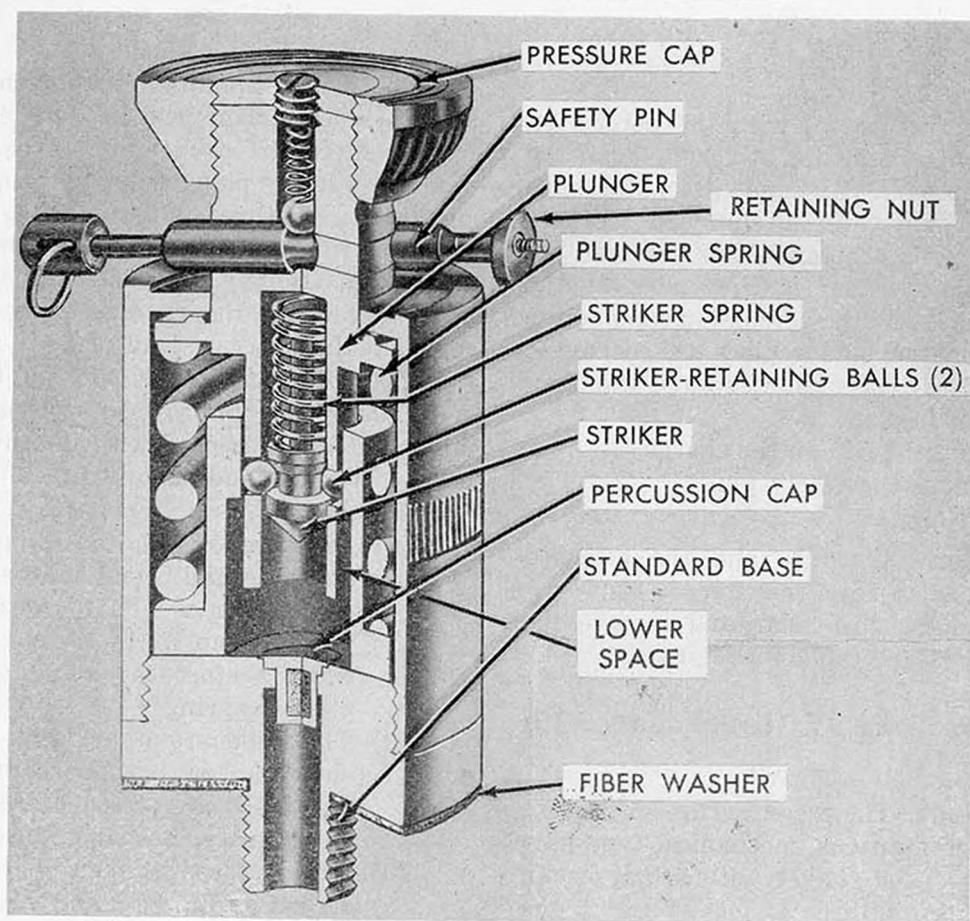
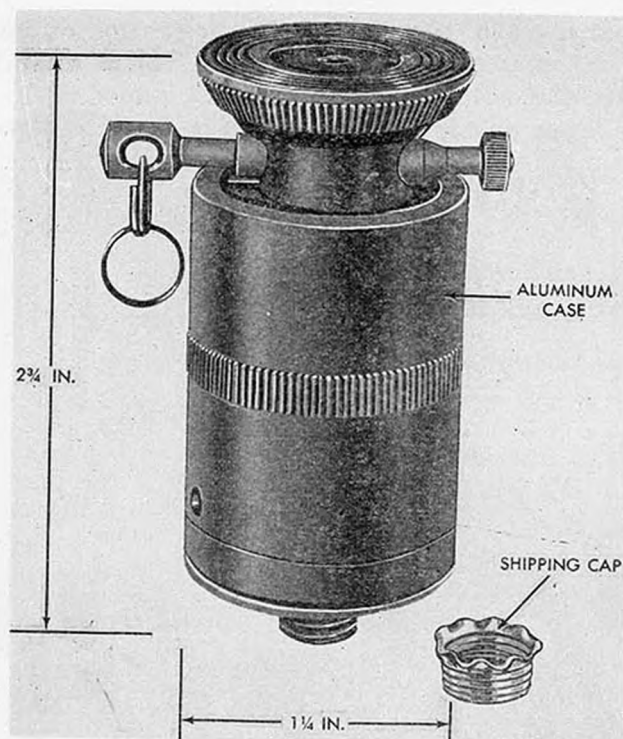


Figure 27. Pressure fuze 35A.



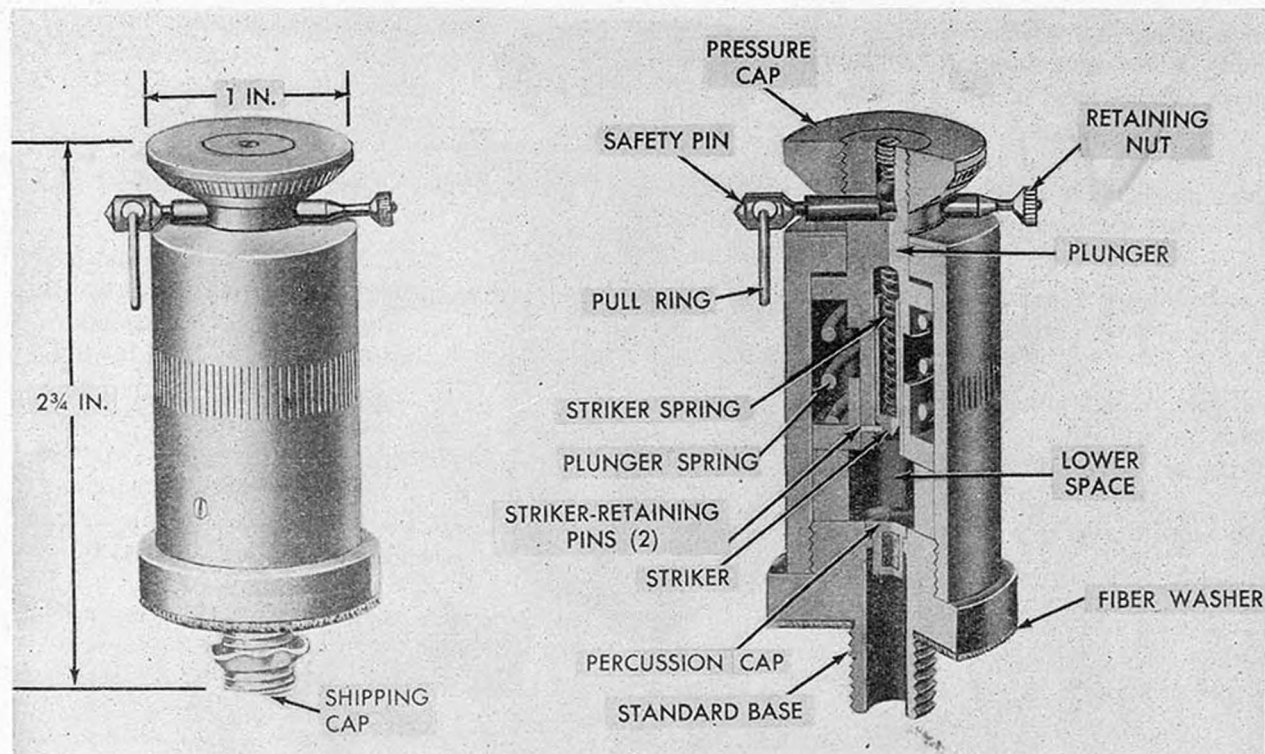


Figure 28. Pressure fuze 35B.

*d. Installing and Arming.*

- (1) The fuze comes with the percussion cap and detonator attached, but if the percussion - cap - and - detonator have been removed, a standard German percussion-cap-and-detonator can be inserted. Remove the collar at the base, insert the percussion cap and the detonator, and replace the collar to hold the percussion cap and the detonator in place.
- (2) Insert the fuze in the charge.
- (3) Remove the safety pin.

*e. Neutralizing.*

- (1) Remove the fuze and the attached detonator from the charge.
- (2) Unscrew the collar and remove the percussion cap and detonator.

## 24. Pressure Fuze 35 (Druckzünder 35; D.Z. 35)

*a. Description.* The pressure fuze 35 (fig. 27, 28) is an instantaneous, mechanical type having a spring-loaded striker with a ball or pin release. It exists in three models. Model A, the largest of the three, is shown in figure 27. It

consists of an aluminum case containing a spring-loaded striker held in a cocked position by two steel striker-retaining balls, a safety pin, and a heavy plunger spring. Model B, the smallest of the three, is shown in figure 28. It is housed in a brass case. The striker is held in a cocked position by two small striker-retaining pins. Model C is the same as the model A except that the fuze case is of plastic.

*b. Employment.* Models 35A and C are generally used with improvised wooden antitank mines. Model B is used with improvised anti-personnel mines and booby traps.

*c. Functioning.*

- (1) Pressure of 125 to 165 pounds for models A and C and approximately 65 pounds for model B, exerted on the pressure cap, forces the plunger downward against the resistance of the plunger spring.
- (2) The striker-retaining balls (models A and C) or striker-retaining pins (model B) are forced outward into the lower space, releasing the striker.
- (3) The released striker, driven by the striker spring, fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Examine the fuze to be sure the percussion cap is in place and intact.
- (2) Insert a detonator in the base of the fuze.
- (3) Screw the fuze into a mine or charge.
- (4) Adjust the height of the pressure cap by rotating it.
- (5) Remove the retaining nut from the end of the safety pin and withdraw the pin from a safe distance with a wire or string attached to the pull ring.

*e. Neutralizing.*

- (1) Insert the safety pin, or a nail, into the hole in the plunger.

- (2) Remove the fuze from the mine or charge.

- (3) Remove the detonator and the percussion cap from the fuze.

*f. Packing.* These fuzes are packed four to a tin box with a descriptive label on the lid.

**25. S-mine Fuze 35 (S-Minenzünder 35; S.Mi.Z. 35)**

*a. Description.* The S-mine fuze 35 (fig. 29) is an instantaneous, mechanical type,  $3\frac{3}{4}$  inches long by  $\frac{3}{4}$  inches in diameter. A round case of aluminum, steel, or bakelite contains a spring-loaded striker held by two steel striker-retain-

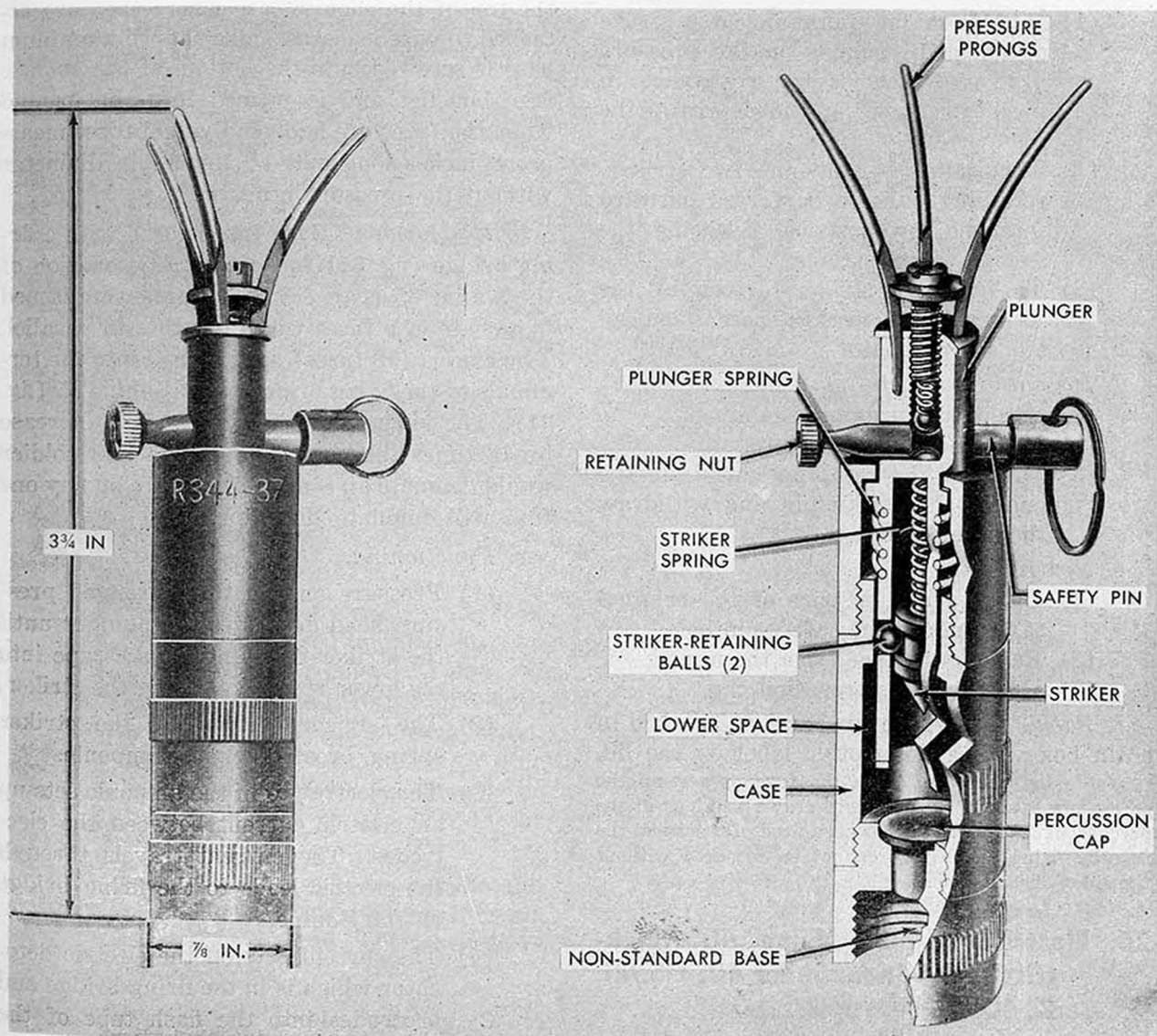


Figure 29. S-mine fuze 35.

ing balls and a safety pin. The fuze has a plunger which has three removable pressure prongs projecting from it. This fuze does not have a standard threaded base, since it is designed to be screwed onto the threaded fuze post on the top of an S-mine 35 (par. 85). The percussion cap may be unscrewed from the fuze.

*b. Employment.* This fuze is the standard German pressure fuze for the antipersonnel S-mine 35. The mine is usually buried with only the tips of the pressure prongs of the fuze above the surface of the ground. This fuze was also often used with other antipersonnel mines, such as the ski mine (par. 107) and the German-adopted Finnish ice mine (par. 101).

*c. Functioning.*

- (1) With the safety pin removed, pressure of about 15 pounds on the pressure prongs overcomes the resistance in the plunger spring and depresses the plunger.
- (2) This action permits the two striker-retaining balls to be forced outward into the lower space, releasing the spring-loaded striker.
- (3) The released striker, driven by the striker spring, fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Screw the fuze onto the mine.
- (2) Place the mine in the ground.
- (3) Unscrew the retaining nut from the end of the safety pin and withdraw the safety pin.

*e. Neutralizing.*

- (1) Insert a nail or wire or the original safety pin in the safety-pin hole.
- (2) Remove the fuze from the mine.
- (3) Unscrew the percussion cap.

*f. Packing.* Three or six fuzes are packed in a tin box with a descriptive label on the lid.

*Note.* Before reuse, check the fuze by testing the safety pin to see if it can be withdrawn and look at the percussion cap to see if it has been fired. Do not test the fuze by firing. This fuze cannot be recocked without the aid of special tools.

## **26. Electrical S-mine Fuze 40 (Elektrische S-Minenzündler 40; E.S.Mi. Z. 40)**

*a. Description.* The electrical S-mine fuze 40

(fig. 30) is an instantaneous, mechanical-electrical type having a spring-loaded striker with a ball release. The fuze consists of a cylindrical ebonite case into which is screwed a pressure-fuze mechanism consisting of a spring-loaded striker held by two striker-retaining balls, as in the S-mine fuze 35 (par. 25). A shipping cap is screwed over the top of the fuze during shipment. When the fuze is armed the shipping cap is removed and a three-pronged pressure head is pushed on over the plunger of the fuze. Instead of a percussion cap, a porcelain fitting containing a glass ampoule of orange-colored electrolyte is screwed into the base of the ebonite case. Two electrodes project into the ampoule cavity and are connected to terminals on the top of the ebonite case where they are attached to wire leads. A spike-shaped aluminum base is screwed onto the bottom of the ebonite fuze housing and is pushed into the ground when the fuzes are laid. Individual fuzes measure 8 inches long and 1½ inches in diameter without the pressure head.

*b. Employment.* This fuze is used with a firing bridge (fig. 31) for electrical detonation of the S-mine 35 (par. 85). The fuzes were issued in a chain of 9 fuzes wired together in parallel. Two chains (18 fuzes) are plugged into the terminals of the firing bridge on an S-mine 35 (fig. 31). The purpose of chain fuzes is to increase by 18 times the possibility that a foot soldier would detonate an S-mine. Pressure on any one fuze will detonate the mine.

*c. Functioning.*

- (1) Pressure on the three-pronged pressure head depresses the plunger until the striker-retaining balls escape into the lower recess, releasing the striker.
- (2) The striker, driven by the striker spring, breaks the glass ampoule.
- (3) The electrolyte in the ampoule sets up an electric current between the electrodes. The current travels through the electric leads to the firing bridge on the S-mine.
- (4) The current sets off the electric detonator which is in the firing bridge and protrudes into the flash tube of the mine.



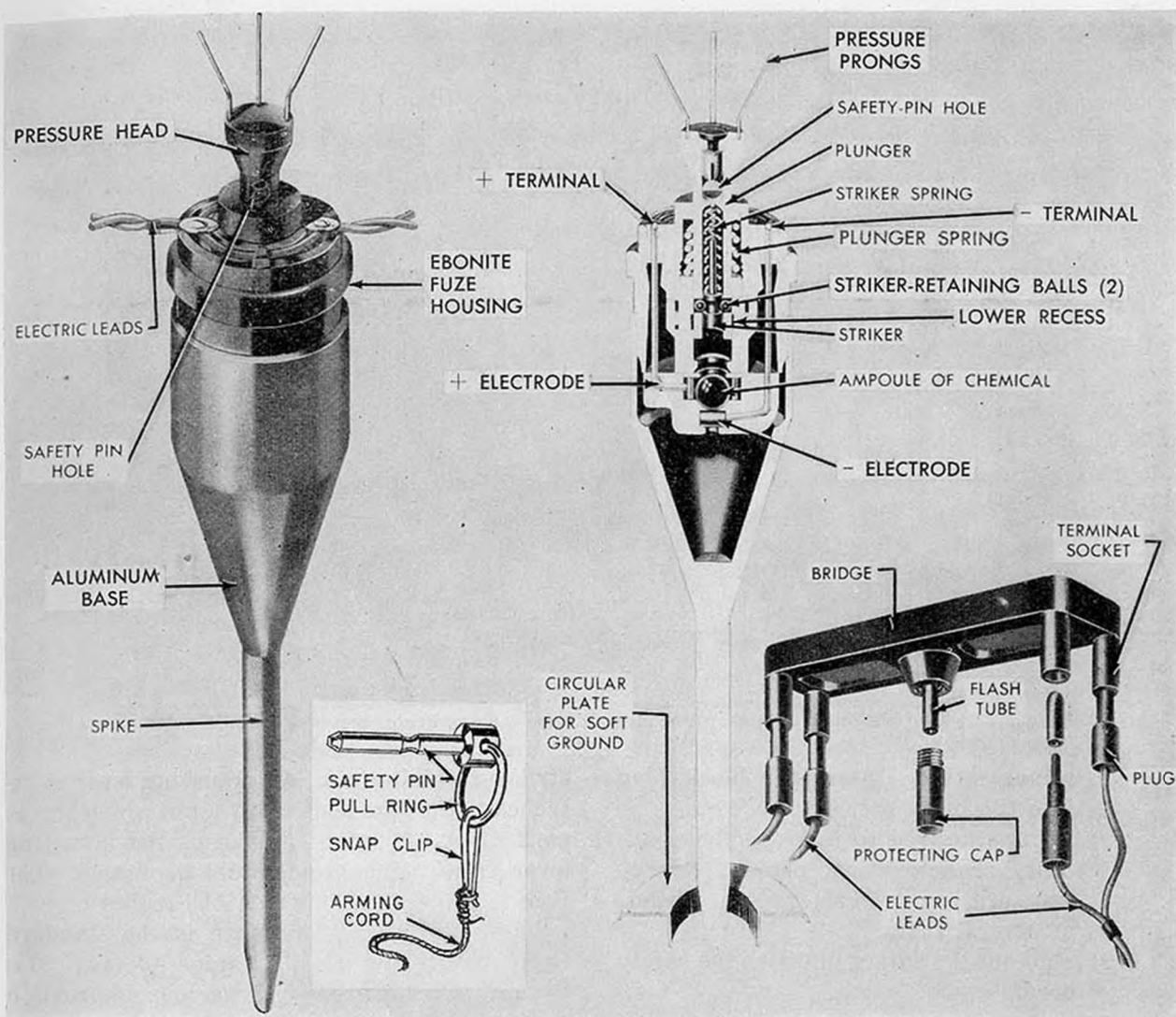


Figure 30. Electrical S-mine fuze 40.

#### d. Installing and Arming.

- (1) If the fuzes are not already connected, connect the desired number in two chains. The fuzes must be connected in parallel with each other and with the firing bridge within each chain. Each chain may include up to nine fuzes. Individual fuzes should be spaced from 2 to 3 feet apart in the chain.
- (2) Dig a hole to receive the S-mine and firing bridge and make two furrows to accommodate the lead wires from the fuze chains.
- (3) Test the circuit with a lead tester (plug in the leads to the lead tester,

short circuit both terminals of the most distant fuze, and break the circuit again).

- (4) Push the spike of the fuze into the ground until the top of the shipping cap is level with the surface of the ground.
- (5) Unscrew the shipping cap and press the pressure head onto the head of the plunger.
- (6) Attach the snap clip of the safety cord to the pull ring of the safety pin.
- (7) Screw the firing bridge onto the S-mine and install the U-clamp.
- (8) Insert the red plug at one end of a chain of fuzes into the red bridge ter-

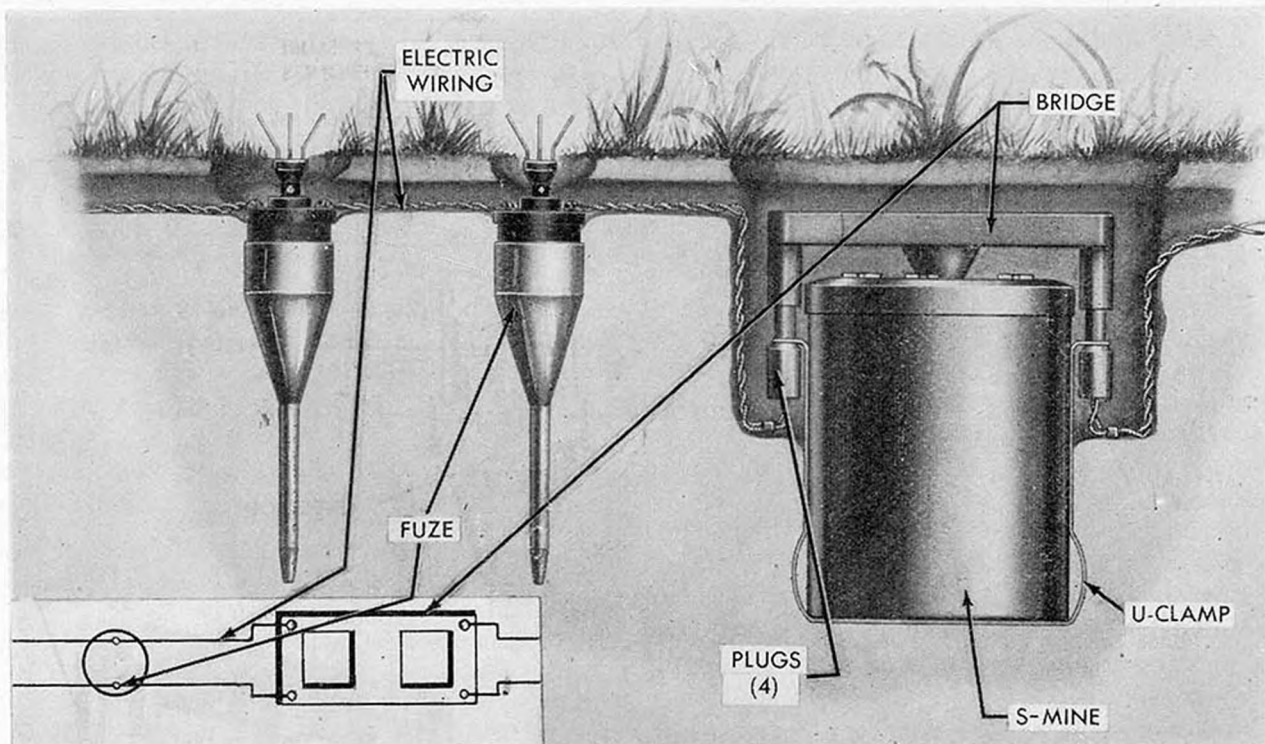


Figure 31. Two electrical S-mine fuzes plugged into a firing bridge mounted on an S-mine 35.

minal socket. Insert the black plug into the black socket.

- (9) If it is desired to increase the possibility of detonation, place a wooden pressure bar over the pressure heads of several fuzes.
- (10) Pull out the safety pin with the safety cord.

*e. Neutralizing.*

- (1) To neutralize a chain of electric fuzes, remove the plugs at the end of the chain of fuzes from the sockets in the firing bridge.
- (2) To neutralize an individual electric fuze, insert a nail into the safety-pin hole and tape it in place.
- (3) Fuzes may also be neutralized by cutting the wire leads one at a time.

## 27. Lever Fuze 44 (Hebelzünder 44)

*a. Description.* The lever fuze 44 (fig. 32) is an instantaneous, mechanical type containing a spring-loaded striker with a striker-retaining-pin release. It consists of an L-shaped metal housing containing a spring-loaded striker held in a cocked position by a winged

striker-retaining pin. An actuating lever is attached to the fuze housing by a pin which serves as a pivot. A safety pin keeps the actuating lever from being accidentally depressed. The fuze is  $2\frac{3}{8}$  inches long and  $1\frac{1}{2}$  inches high.

*b. Employment.* This fuze is the standard German fuze for the glass mine 43 (par. 97). It may also be used with various improvised mines and booby traps.

*c. Functioning.*

- (1) A pressure of from 20 to 25 pounds on the actuating lever causes the actuating lever to pivot at the actuating-lever-pivot pin.
- (2) The lower end of the actuating lever engages the wings of the striker-retaining pin, pulling it out of the striker shaft.
- (3) The released striker, driven by the compressed striker spring, fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Insert a detonator in the base of the fuze.
- (2) Screw the fuze into the mine or charge.
- (3) Remove the safety pin.

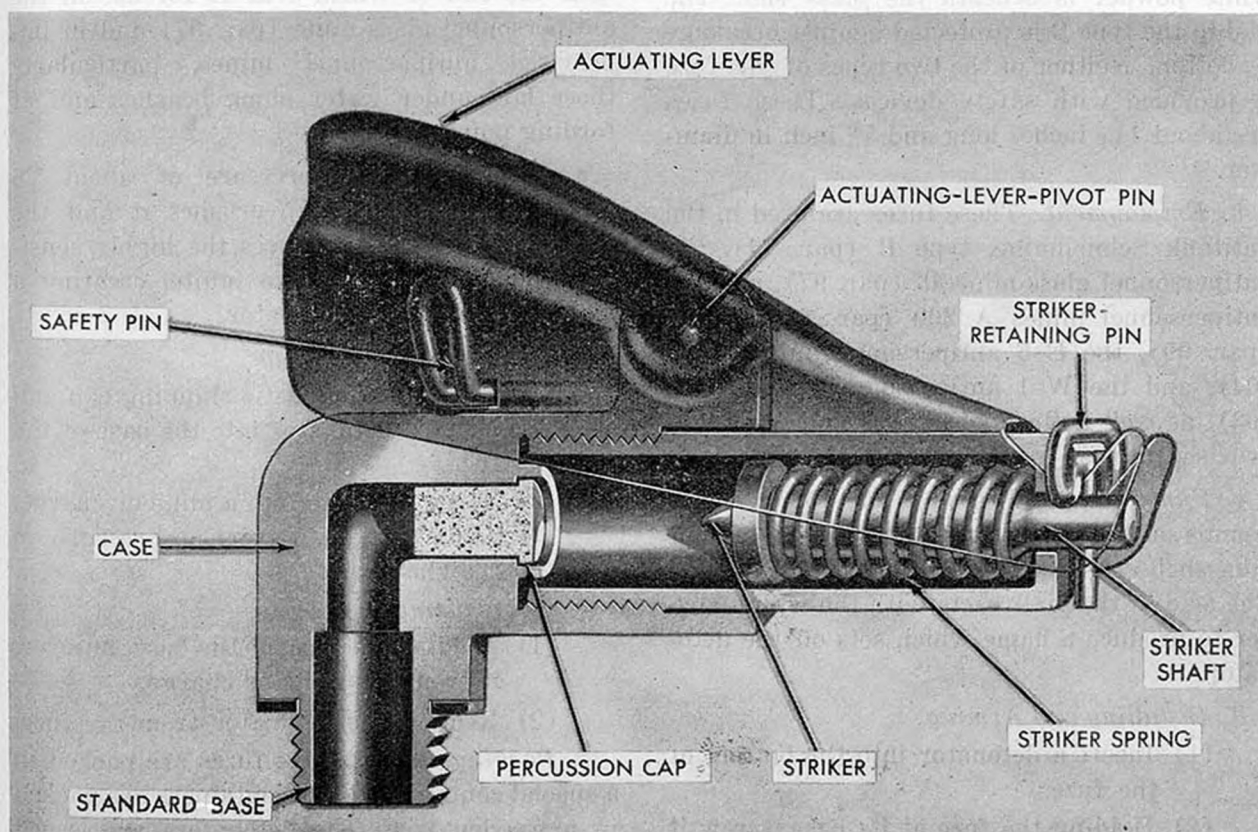
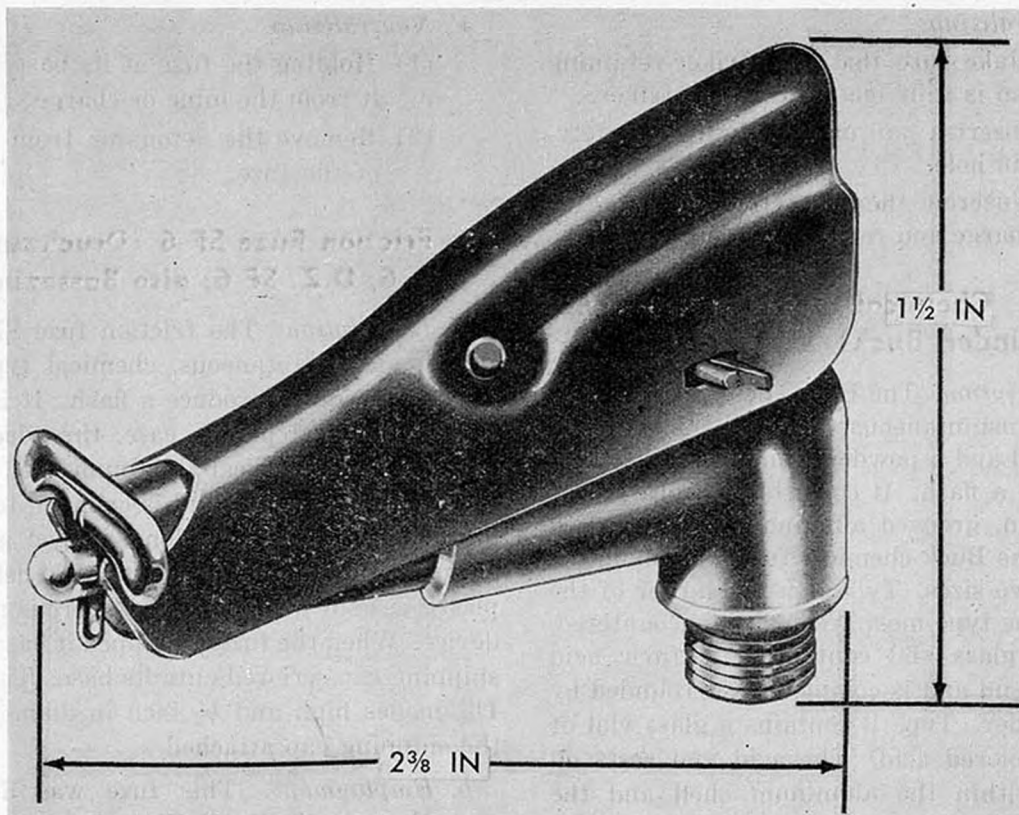


Figure 32. Lever fuze 44.



*e. Neutralizing.*

- (1) Make sure that the striker-retaining pin is fully engaged in the striker.
- (2) Insert a nail or wire into the safety-pin hole.
- (3) Unscrew the fuze from the mine or charge and remove the detonator.

## **28. Buck Chemical Fuze (Chemischer Zünder, Buck)**

*a. Description.* The Buck chemical fuze (fig. 33) is an instantaneous, chemical type employing an acid and a powder which react together to produce a flash. It consists of a brass base with a thin, grooved aluminum shell crimped over it. The Buck chemical fuze was manufactured in two sizes. Type A is the larger of the two and the type most frequently encountered. In it the glass vial containing sulfuric acid stands on end and is completely surrounded by white powder. Type B contains a glass vial of a purple-colored acid. The acid vial rests on its side within the aluminum shell and the white powder is beneath the glass vial. The vial in the type B is protected against breakage by cotton. Neither of the two types of this fuze is provided with safety devices. These fuzes are about 1 1/4 inches long and 5/8 inch in diameter.

*b. Employment.* These fuzes are used in the antitank Schnellmine, type B (par. 74), the antipersonnel glass mine 43 (par. 97), and the antipersonnel mines A 200 (par. 89), S 150 (par. 90), the E-5 antipersonnel mine (par. 104), and the W-1 antipersonnel mine (par. 103), as well as in booby traps and other improvised mines.

*c. Functioning.* Pressure of 15 or more pounds on the top or on the side of the aluminum shell crushes the shell and the glass vial. The acid in the vial reacts with the white powder to produce a flame which sets off the detonator.

*d. Installing and Arming.*

- (1) Insert a detonator into the bottom of the fuze.
- (2) Holding the fuze at its base, screw it into the mine or charge.

*e. Neutralizing.*

- (1) Holding the fuze at its base, unscrew it from the mine or charge.
- (2) Remove the detonator from the base of the fuze.

## **29. Friction Fuze SF 6 (Druckzünder SF 6; D.Z. SF 6; also Bossezünder)**

*a. Description.* The friction fuze SF 6 (fig. 34) is an instantaneous, chemical type using friction action to produce a flash. It is housed in a cylindrical plastic case, threaded at the base. A hemispherical aluminum hood containing a chemical compound is crimped to the top of the plastic case. A dome-shaped glass cap encloses the aluminum hood and is held to the plastic case by a rubber seal. There is no safety device. When the fuze is shipped it has a plastic shipping cap screwed onto its base. The fuze is 1 1/4 inches high and 1/2 inch in diameter with the shipping cap attached.

*b. Employment.* This fuze was developed near the end of World War II for use in the antipersonnel glass mine (par. 97) and in improvised antipersonnel mines, particularly those laid under water along beaches and at fording points in rivers.

*c. Functioning.* A pressure of about 26 pounds on the glass cap crushes it and the aluminum hood. This causes the highly sensitive chemical compound to ignite, creating a flame and firing the detonator.

*d. Installing and Arming.*

- (1) Unscrew the plastic shipping cap and insert a detonator into the base of the fuze.
- (2) Screw the fuze into a mine or charge, being careful to exert no pressure on the glass cap.

*e. Neutralizing.*

- (1) Holding the fuze at the base, unscrew it from the mine or charge.
- (2) Remove the detonator from the fuze.

*f. Packing.* Twenty-five fuzes are packed in a special container. Four containers are packed in a wooden box. The detonators are issued separately.

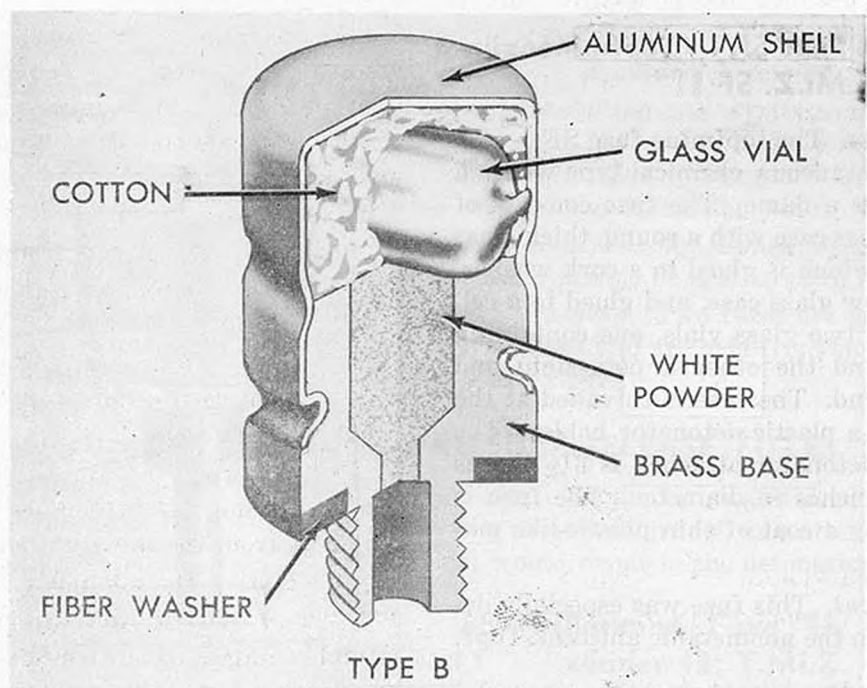
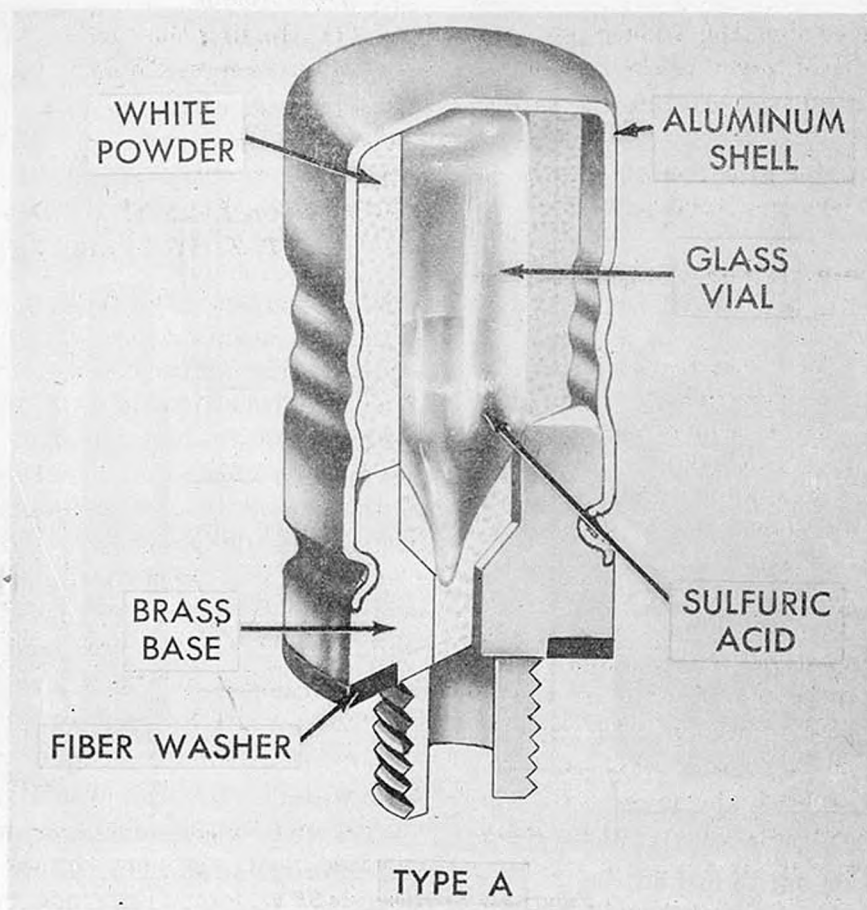


Figure 33. Buck chemical fuzes, type A and B.

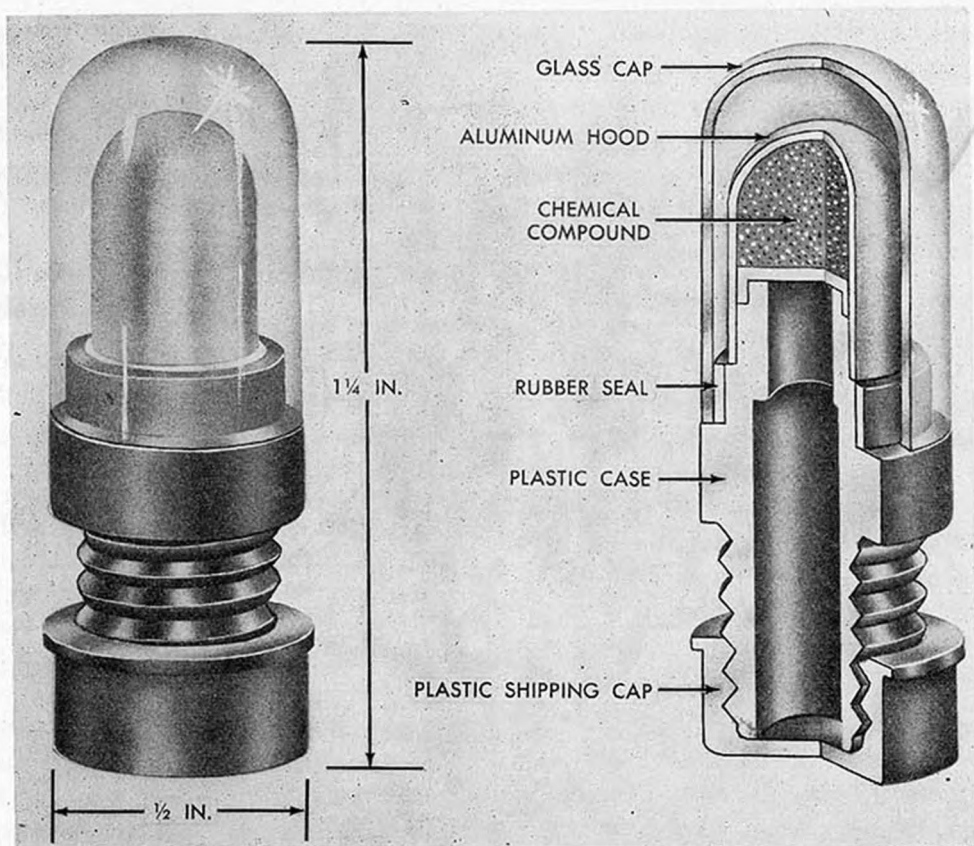


Figure 34. Friction fuze SF 6.

### 30. Topfmine Fuze SF 1 (Topfminenzünder, To.Mi.Z. SF 1)

*a. Description.* The topfmine fuze SF 1 (fig. 35) is an instantaneous, chemical type where a chemical creates a flame. The fuze consists of a cylindrical glass case with a round, thick glass pressure head which is glued to a cork washer. Inside the hollow glass case, and glued to a celluloid disk, are two glass vials, one containing ethyl nitrate and the other a potassium and sodium compound. The case is threaded at the base to fit into a plastic detonator holder. The fuze with the detonator attached is  $3\frac{1}{2}$  inches high and  $1\frac{1}{2}$  inches in diameter. The fuze is waterproofed by a coat of thin plastic-like material.

*b. Employment.* This fuze was especially designed for use in the nonmetallic antitank Topfmine (par. 75).

*c. Functioning.*

(1) Pressure of at least 132 pounds on the

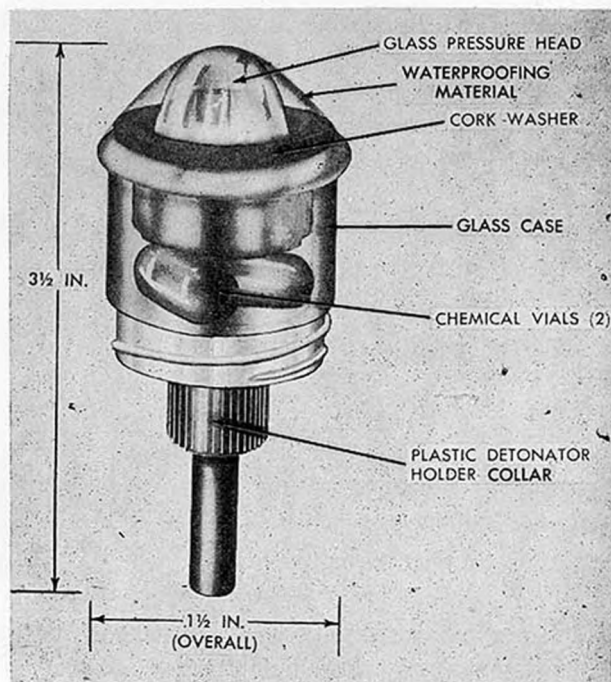


Figure 35. Topfmine fuze SF 1.



glass pressure head shears off the glass rim of the pressure head at the shear groove, allowing the pressure head to crush the two glass vials of chemicals.

- (2) The chemical reaction between the two chemicals creates a flame which sets off the detonator.

*d. Installing and Arming.*

- (1) Insert a nonmetallic detonator into the plastic detonator holder and screw it to the base of the fuze with the plastic detonator-holder collar.
- (2) Screw the fuze into the wooden fuze adapter in the Topfmine.

*e. Neutralizing.*

- (1) Remove the fuze from the wooden fuze adapter.
- (2) Unscrew the plastic detonator holder and remove the detonator.

*f. Packing.* Six fuzes are packed in a narrow cardboard box with the abbreviation "SF 1" stamped on the lid.

### 31. Chemical Fuze SF 18 (Schützen-Küstenminenzünder SF 18; S-Kst. Mi.Z. SF 18; also Druckzünder SF 18; D.Z. SF 18)

*a. Description.* The chemical fuze SF 18 (fig. 36) is an instantaneous, nonmetallic, chemical type designed especially for employment in the glass mine (par. 97) when that mine is used under water. The fuze is an integral part of the glass separator plate situated between the glass pressure plate and the charge of the mine. The fuze is actually a modified version of the Topfmine fuze SF 1 (par. 30) and has the same component parts: a glass pressure head with a shear rim above two vials of chemicals glued to a celluloid disk over a hole.

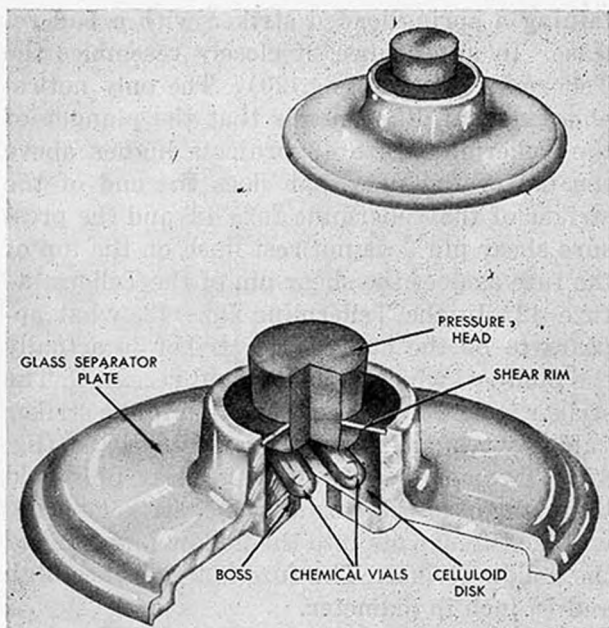


Figure 36. Chemical fuze SF 18.

*b. Employment.* The fuze was designed for employment in the glass mine 43 (par. 97) when it is used under water.

*c. Functioning.*

- (1) A pressure of about 37 pounds shears off the rim of the glass pressure head which crushes the two vials of chemicals.
- (2) The chemical reaction causes a violent flame which sets off the detonator.

*d. Installing and Arming.* Place the fuze on the main charge in the bottom of a glass mine 43 so the edge of the glass fuze housing rests on the ledge inside the mine.

*e. Neutralizing.* Mines fitted with this fuze should *always* be destroyed in place.

*f. Packing.* Two fuzes are packed in a cardboard box and are held from movement by cardboard rings.

## Section III. PRESSURE, PRESSURE-RELEASE FUZES

### 32. General

Pressure, pressure-release fuzes can be actuated by two methods, either by applying direct pressure on the top of the fuze or by releasing pressure by removing a weight from the top of the fuze after it has been inserted and armed in the mine. During World War II this type of fuze was known as the antiremoval fuze be-

cause, once the fuze was placed in the mine, and the mine was armed, any attempt to neutralize it would result in the detonation of the mine.

### 33. Tellermine Fuze 43 (Tellerminen-zünder 43; T.Mi.Z. 43)

*a. Description.* The Tellermine fuze 43 (fig. 37) is an instantaneous, mechanical type con-

taining a spring-loaded striker with a ball release. In appearance, it closely resembles the Tellermine fuze 42 (fig. 20). The only noticeable external difference is that the plunger of the Tellermine fuze 43 projects higher above the top of the fuze than does the end of the striker of the Tellermine fuze 42, and the pressure shear pin does not rest flush on the top of the fuze as does the shear pin of the Tellermine fuze 42. In the Tellermine fuze 43, what appears to be the end of the striker is actually the plunger, which is hollow and recessed. The striker is held in a cocked position to the striker guide by two small striker-retaining balls (fig. 37). Two small brass arming shear pins hold the plunger to the fuze case. A striker spring with a stiffener fits into the hollow plunger and the hollow striker. The fuze is  $2\frac{1}{4}$  inches high and  $\frac{7}{8}$  inch in diameter.

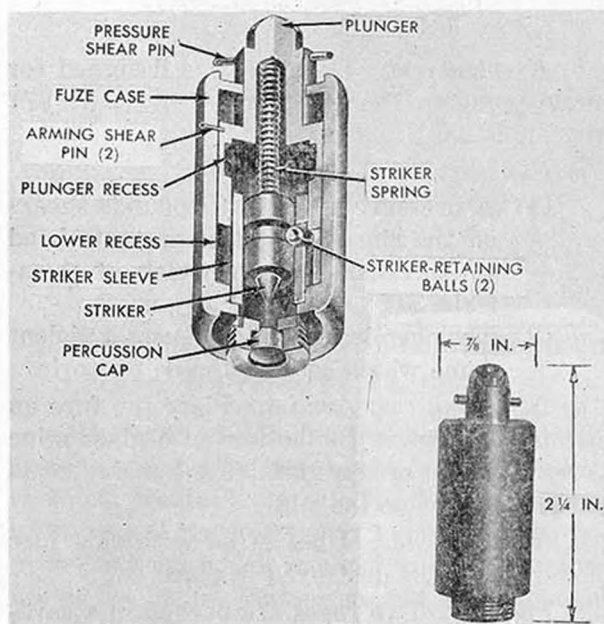


Figure 37. Tellermine fuze 43.

**b. Employment.** This fuze was designed for use in the Tellermine 43 (par. 65). It can also be used in the Tellermine 35 (steel) (par. 63) and 42 (par. 64).

**c. Functioning.**

- (1) **Pressure.** Pressure of about 400 pounds on the end of the plunger depresses the plunger and compresses the striker spring until the pressure shear pin bears on the top of the fuze case. The plunger then shears the

pressure shear pin and depresses further until its recess is opposite the striker-retaining balls which fall into the plunger recess, releasing the spring-loaded striker against the percussion cap which sets off the detonator.

- (2) **Pressure release.** Removing the pressure from the plunger causes the plunger to ride up under the force of the compressed striker spring until the two striker-retaining balls become uncovered and fall into the lower recess, releasing the spring-loaded striker against the percussion cap which sets off the detonator.

**d. Installing and Arming.**

- (1) Attach a detonator to the fuze by screwing it to the base of the fuze with a detonator-retaining collar.
- (2) To arm the fuze, screw down the pressure plug of the mine (Tellermine 35 or 42) so it bears on the end of the plunger, pressing against it until a click is heard. The click indicates that the arming shear pins which hold the plunger to the case of the fuze have sheared off. The plunger is now free to move upward under pressure release or downward under pressure.

**e. Neutralizing.** This fuze cannot be neutralized; once it has been armed it must be destroyed in place.

**f. Packing.** Six fuzes, with detonators, are packed in a rectangular cardboard box.

### 34. Tellermine Fuze 44 (Tellermine-zünder 44; T.Mi.Z. 44)

**a. Description.** The Tellermine fuze 44 (fig. 38) is an instantaneous, mechanical type containing a spring-loaded striker with both a shear pin and a ball release. It is  $2\frac{5}{16}$  inches long and  $\frac{7}{8}$  inch in diameter. It is painted black and resembles the Tellermine fuze 43 except for the top. Instead of one round-ended plunger projecting above the top of the fuze case, there are two telescoping, flat-topped plungers (compare figures 37 and 38). The arming plunger is held within the main plunger by two arming shear wires. A large shear pin passes through the lower part of the fuze case.

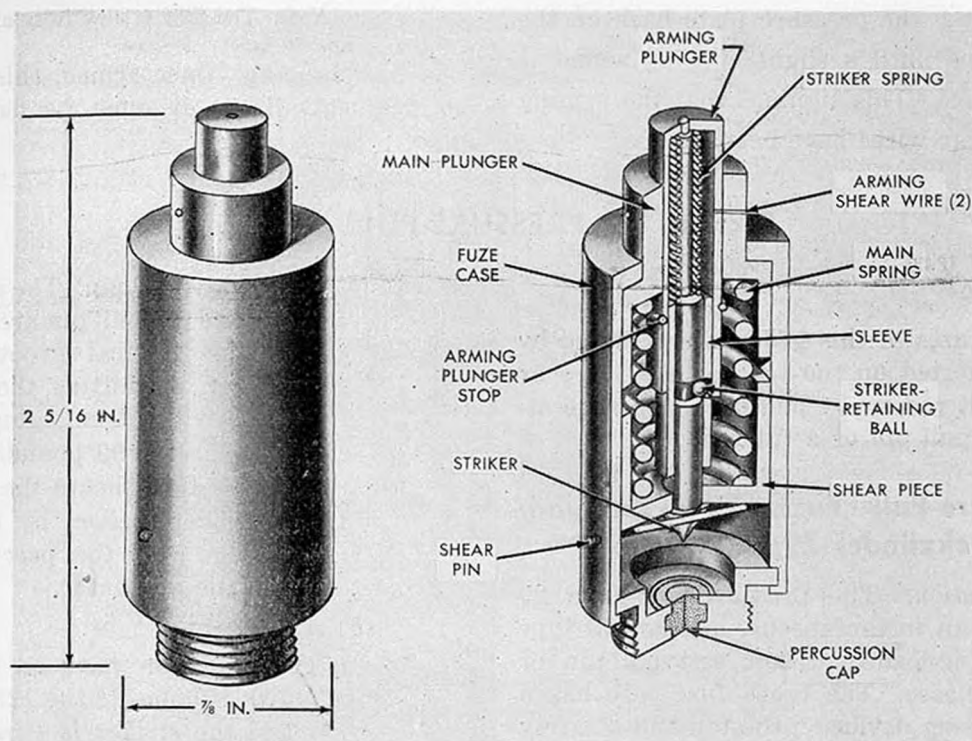


Figure 38. Tellermine fuze 44.

*b. Employment.* The Tellermine fuze 44 was never employed, since it existed only as a pilot model at the end of World War II. It was designed to be employed, however, in the Tellermines 35 (steel), (par. 63) 42, (par. 64) and 43 (par. 65).

*c. Functioning.* After the fuze has been screwed into the mine, the pressure plate of the mine is screwed on. The pressure plate moves down on the top of the arming plunger, forcing it down, compressing the striker spring, and shearing the arming shear wires which hold the main plunger and the arming plunger together. The arming plunger is now forced down flush with the top of the main plunger. From this point the fuze can function in one of two ways:

- (1) *Pressure.* Under pressure of at least 250 pounds, the main plunger is forced down, compressing the main spring until the main plunger contacts the shear piece. Continued pressure shears the shear pin, and the main spring forces the shear piece, the sleeve, and the striker down onto the percussion cap firing the detonator.
- (2) *Pressure release.* Unscrewing the

pressure plate of the mine releases the pressure on the arming plunger of the fuze. The arming plunger rides up under the pressure of the compressed striker spring until the lower end of the arming plunger uncovers the striker-retaining balls, allowing them to drop out and thus release the spring-loaded striker against the percussion cap firing the detonator. A thin wire (arming plunger stop) fits in a groove around the arming plunger and keeps the plunger in the fuze, should the arming shear wires break before the fuze is inserted into the mine.

*d. Installing and Arming*

- (1) Unscrew the pressure plate of the mine (Tellermine 35 (steel), 42, or 43).
- (2) Examine the fuze and the percussion cap closely to make sure that the fuze has not been fired.
- (3) Without exerting any pressure on the plungers, grasp the fuze around the case and screw it in the fuze well of the mine.



- (2) Turn the slotted disk to the desired setting (c above).
- (3) Screw the fuze into the mine.
- (4) Attach a wire or cord to the ring on the safety bar and remove the bar from a safe distance.

*Note.* If the indicator mark is set at ZUG and the pull pin is withdrawn by accident before the safety bar is removed, the striker engages in a slot in the safety bar and prevents removal of the bar.

*e. Neutralizing.*

- (1) If the original safety bar is available, insert it in the slot marked SICHER. Do not try to insert an improvised safety bar such as a nail or penknife into the slot marked SICHER because an edge may come into contact with the percussion cap and cause it to explode. If the safety bar is not available, the fuze may still be neutralized by following steps (2) through (6).
- (2) Cut any slack trip wires attached to the pull pin.
- (3) Grasp the fuze around its base without touching the top.
- (4) Gently unscrew the fuze from the mine.
- (5) Remove the detonator from the fuze.
- (6) Unscrew the percussion-cap-holder set screw and unscrew the percussion-cap-holder from the base of the fuze.

### 37. S-Mine Fuze 44 (S-Minenzünder 44; S.Mi.Z. 44)

*a. Description.* The S-mine fuze 44 (fig. 40) is an instantaneous, mechanical type containing a spring-loaded striker with a lever-arm release. It is housed in a cylindrical metal case and the overall length of the fuze is 4 inches. The striker is held in a cocked position by two winged striker-retaining arms. The two projections on the inner side of each striker-retaining arm fit into a hole and into a slot in the end of the striker shaft. The base of each striker-retaining arm is held in place by a rim on the top of the fuze body. The force of the compressed striker spring is enough to hold the striker-retaining arms together after the safety pin is removed and thus keep the striker in a cocked position. The hole in each arm is for a trip wire which, if pulled, pulls the striker-

retaining arm away from the top of the striker, releasing the striker against the percussion cap.

*b. Employment.* This fuze was designed for use with the S-mine 44 (par. 86), but was so dangerous to handle and arm that it was seldom employed.

*c. Functioning.*

- (1) *Pressure.* Pressure of about 20 pounds on the top of the striker-retaining arms forces them outward, releasing the spring-loaded striker against the percussion cap firing the detonator.
- (2) *Pull.* Pull of about 14 pounds on a trip wire attached to the trip-wire hole in one or both of the striker-retaining arms, pulls out the arm and releases the striker against the percussion cap firing the detonator.

*d. Installing and Arming.*

- (1) Remove the shipping cap from the base of the fuze.
- (2) Insert a detonator in the base of the fuze and screw the fuze into an S-mine 44.
- (3) If desired, attach anchored trip wires to the trip-wire holes in the striker-retaining arms.
- (4) Carefully pull out the safety pin. This must be done by hand since a sudden pull on the safety pin might dislodge the striker-retaining arms.

*e. Neutralizing.*

- (1) Carefully insert a nail or wire through the safety pin holes in the striker-retaining arms.
- (2) Cut any trip wires attached to the striker-retaining arms.
- (3) Unscrew the fuze from the mine and remove the detonator.

*f. Packing.* Fifteen fuzes are packed in a cardboard box.

### 38. Tilt Fuze 43A (Kippzünder 43A; Ki.Z. 43A)

*a. Description.* The tilt fuze 43A (fig. 41) is an instantaneous, mechanical type containing a spring-loaded striker held by two steel striker-retaining balls, a pressure piece, a pressure spring, and a striker guide which also holds the percussion cap. The tilt rod projects from the

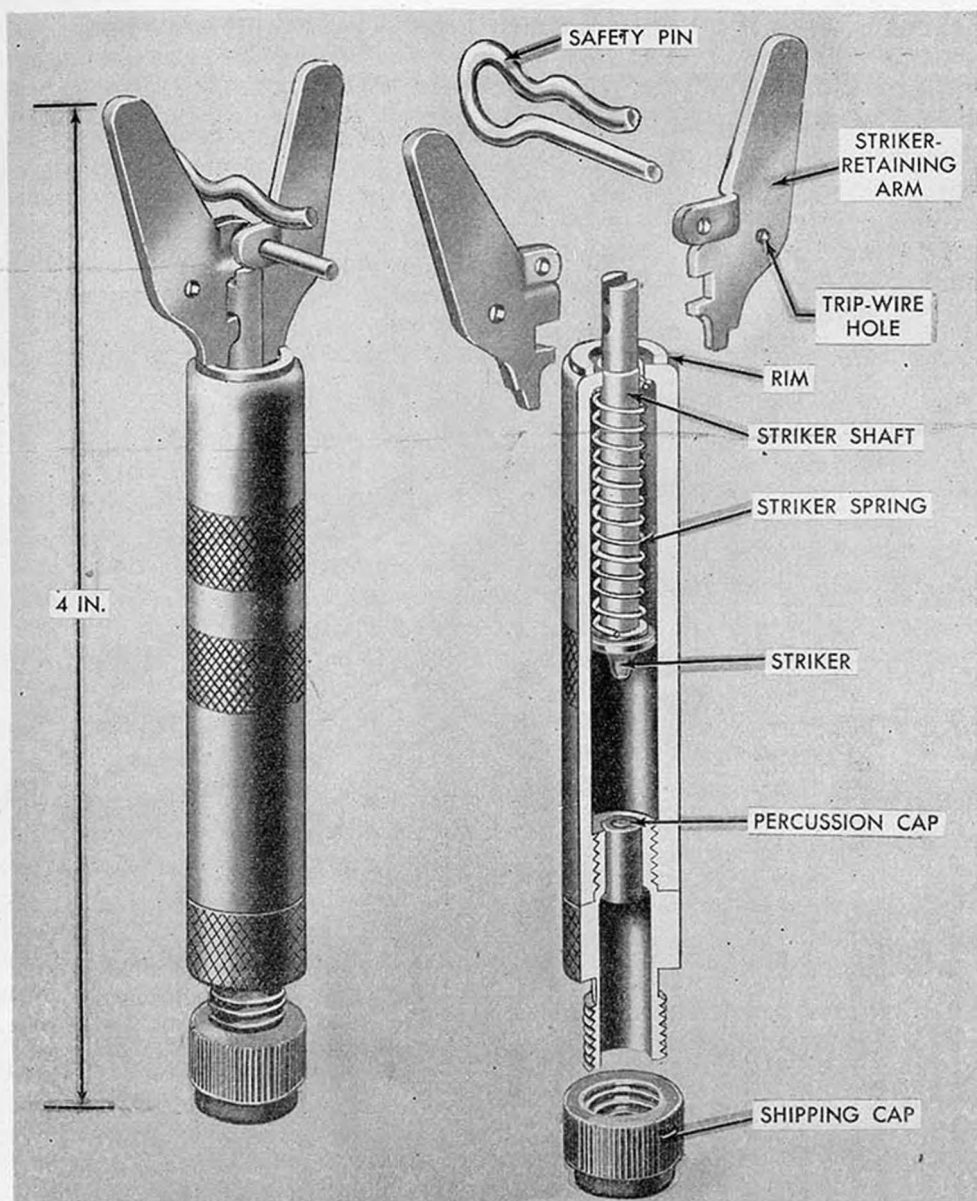


Figure 40. S-mine fuze 44.

tilt-rod base which rests on the top of the pressure piece. The tilt rod and tilt-rod base are kept from moving by a safety pin which passes through them just above the top of the fuze case. A 2-foot tilt-rod extension and a metal retaining sleeve are provided for use in deep snow or high grass. The overall height of the fuze with the tilt-rod extension is approximately 28 inches.

*b. Employment.* Like the snap fuzes (par. 17), tilt fuzes were designed primarily for use with antitank mines buried in grassy or bushy

areas or in snow. They are also used in some antipersonnel mines and booby traps.

*c. Functioning.*

- (1) A lateral pressure or pull of 15.5 to 24 pounds on the tilt rod, or 1.5 pounds at the end of the tilt rod extension, tilts the tilt-rod base. When tilted, the tilt-rod base depresses the pressure piece until the recess in the pressure piece is opposite the two striker-retaining balls.
- (2) The two steel striker-retaining balls

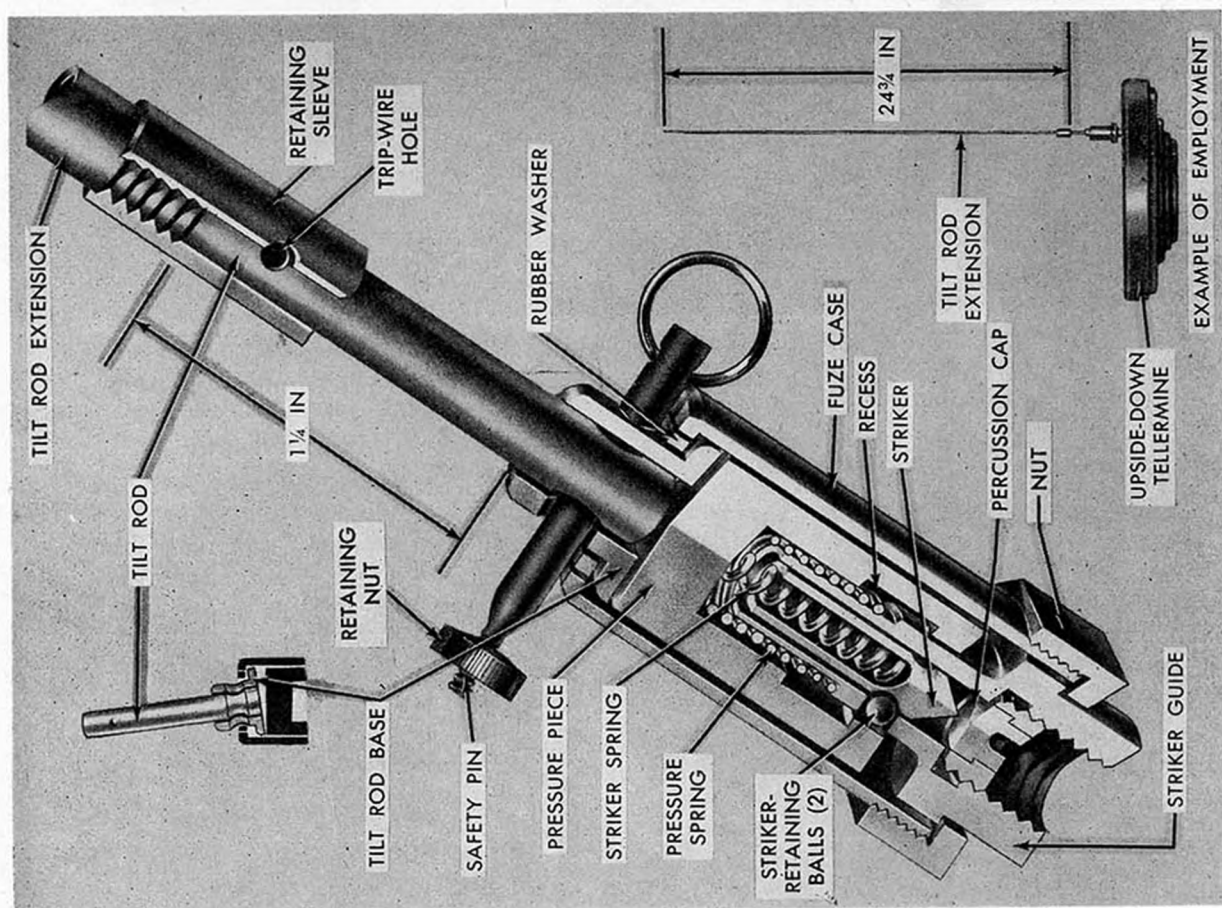
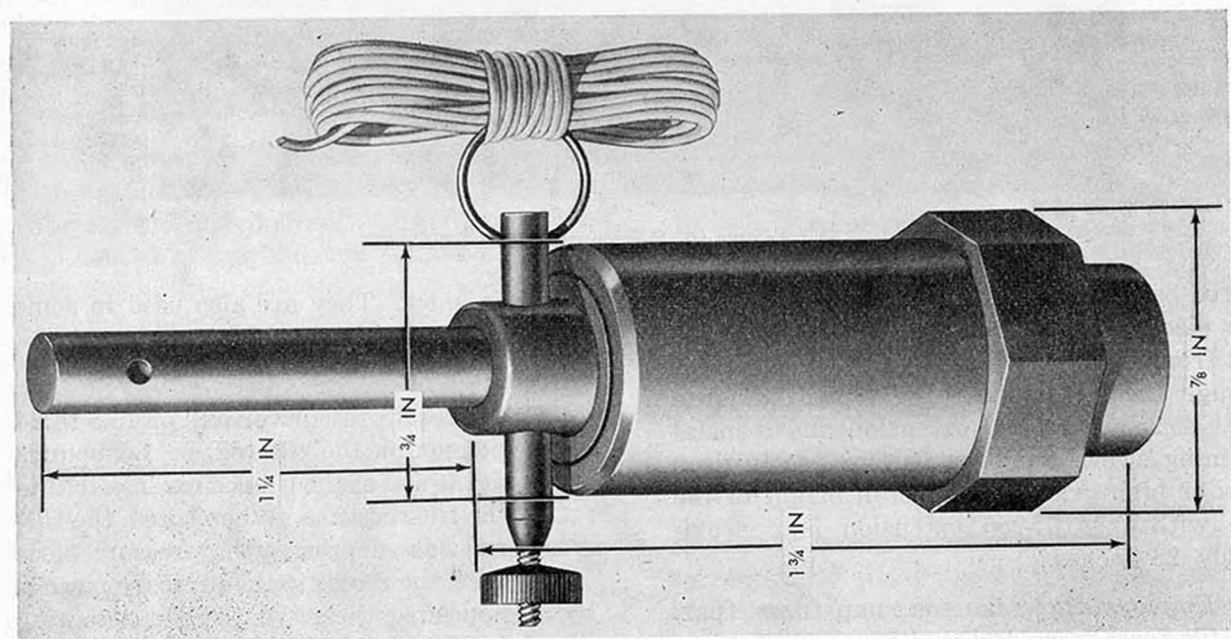


Figure 41. Tilt fuze 43A.



move outward into the recess, releasing the spring-loaded striker.

- (3) The released striker, driven by the striker spring, fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Stake the mine down carefully so that it will not tilt when pressure is applied to the tilt-rod.
- (2) Screw a percussion-cap-and-detonator assembly into the fuze.
- (3) Screw the fuze in the mine. If a very low functioning pressure is desired, screw the retaining sleeve onto the tilt-rod extension and place the tilt-rod extension on the tilt rod.
- (4) Unscrew the retaining nut from the safety pin and remove the safety pin from the fuze at a distance by using wire or cord.

*e. Neutralizing.*

- (1) Replace the safety pin or insert some other suitable object, such as a nail or heavy wire, in the safety-pin hole.
- (2) Unscrew the fuze from the mine.
- (3) Unscrew the percussion-cap-and-detonator assembly from the fuze.

**Caution:** Never touch the tilt rod. If the safety pin is difficult to insert, destroy the mine in place.

*f. Packing.*

- (1) These fuzes are shipped in wooden cases containing 40 cardboard boxes, each of which contains 6 tilt fuzes. The wooden case also contains 240 extension rods and retaining sleeves.
- (2) Detonator assemblies are packed 15 to a box and are not shipped with the fuzes.

*Note.* Before using, see that the fuze is cocked. Fired fuzes can be recocked with a punch or similar object. If the fuze is prepared for underwater use with a waterproof seal, it should not be test-fired. Firing will break the waterproof seal.

### **39. Tilt Fuze 43B (Kippzünder 43B; Ki.Z. 43B)**

*a. Description.* The tilt fuze 43B (fig. 42) is an instantaneous, mechanical type containing a spring-loaded striker with a ball release. It is

similar to the tilt fuze 43A (par. 38) except for the method of arming and the safety device. A tilt rod projects out of the tilt-rod base, which rests on top of a pressure piece. A four-piece collar, fitted just above the tilt-rod base and held in position by the collar-retaining spring, allows the tilt rod to be moved in any direction. A safety nut located at the base of the tilt rod can be screwed down tightly against the four-piece collar to prevent movement of the tilt rod. There is also a safety bolt, housed on the side of the fuze case, which fits under one side of the tilt-rod base. There is a curved indentation in the safety bolt. In the armed position, the curved indentation is positioned directly under the tilt rod, allowing the base to move. There are three positions of the safety bolt controlled by the recesses into which the spring-loaded ball fits. Figure 42 shows the bolt in the middle recess or the normal carrying position. The other two recesses are for the armed position and the safe position. Movement of the safety bolt is controlled by two detachable chains connected to each end of the bolt by scarfed joints. A small identifying tag is fastened to the end of each chain. One tag is marked SICHER (safe) and the other SCHARF (armed). The safety bolt cannot be placed in the safe position until the arming chain has been detached from the safety bolt since the diameter of the metal connector is larger than that of the safety bolt. The fuze without the tilt rod extension is approximately 5 inches high and 1 inch in diameter.

*b. Employment.* This fuze is used in grassy or bushy areas or in snow. It can be used in some antipersonnel mines and booby traps.

*c. Functioning.*

- (1) 10 to 20 pounds pull or pressure against the tilt rod or 2 to 5 pounds pull or pressure on the tilt rod extension depresses the tilt rod base.
- (2) The pressure from the tilt rod base is exerted on the pressure piece causing it to slide downward until the open space in the pressure piece is opposite the striker-retaining ball.
- (3) The striker-retaining ball escapes into the open space and releases the spring-loaded striker.
- (4) The striker fires the percussion cap and the detonator.

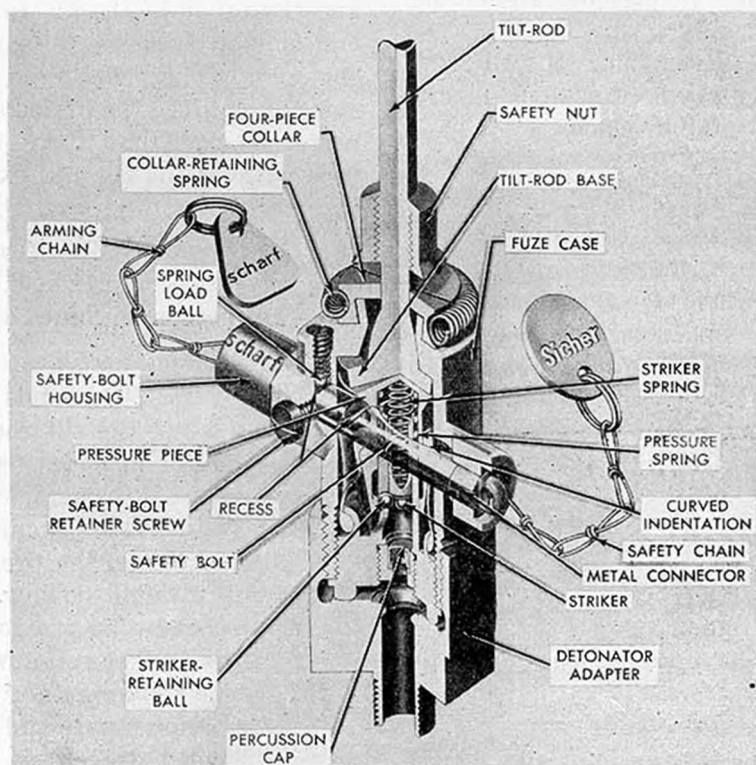
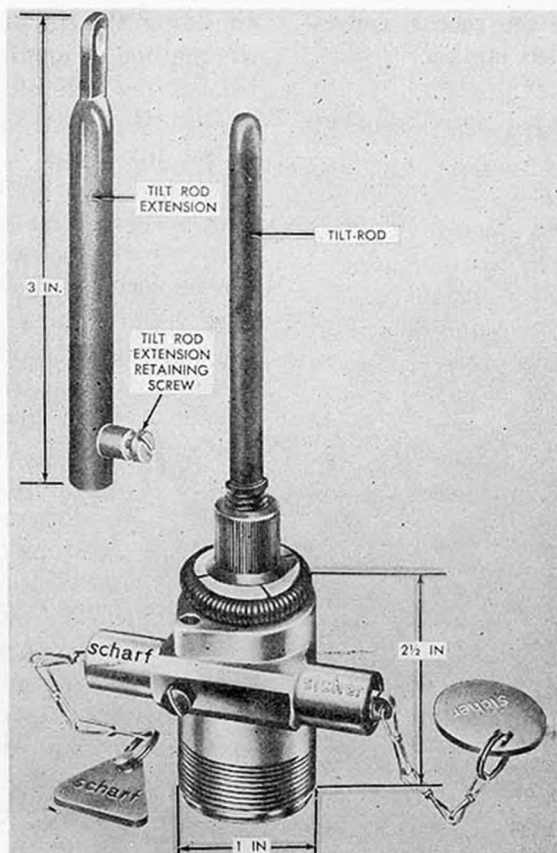


Figure 42. Tilt fuze 43B.

*d. Installing and Arming.*

- (1) Screw the percussion cap into the base of the fuze.
- (2) Screw the detonator adapter onto the base of the fuze and insert a detonator in the adapter.
- (3) Screw the fuze into the fuze well of a mine or charge.
- (4) If a trip wire is to be used, attach it to the tilt rod. (A 2-foot extension may be attached to the rod to increase the chance of detonation.)
- (5) Unscrew the safety nut at the base of the tilt rod.
- (6) Pull out the arming chain (marked SCHARF). This positions the safety bolt so it will allow the pressure piece to be depressed when the tilt rod is tilted.

*e. Neutralizing.*

- (1) Screw the safety nut down tightly against the four-piece collar held in place by the spring clip. If the safety nut is missing, pull the chain marked SICHER. This action brings the safety bolt through the housing, and the bolt rides under the side of the sliding pressure piece, preventing its movement. If the chains are missing, insert a nail into the end of the safety-bolt housing marked SCHARF, and push the safety bolt to the safe position.
- (2) Unscrew the fuze from the mine and remove the detonator.

## 40. Mechanical-Delay Tilt Assembly

*a. Description.* The mechanical-delay tilt assembly (fig. 43) contains a spring-loaded sliding cylinder with a ball actuation. The mechanical-delay tilt assembly consists of a cylindrical housing with two mounting screws threaded horizontally into the base of the assembly. The mounting screws are used to clamp the assembly over the case of a pressure fuze 35B (par. 24) with the pressure head removed or over an S-mine fuze 35 (par. 25) with the prongs removed. In addition to the spring-loaded sliding cylinder, the mechanical delay tilt assembly case contains the base of the short tilt rod, the

short tilt rod, and a pressure piece which rests on a steel ball supported by two flexible rods soldered across a hole in the head of the sliding cylinder (fig. 43).

*b. Employment.* This mechanical-delay tilt assembly was designed to prevent tanks and tank-mounted clearing devices from opening lanes in mine fields by merely running through the field once.

*c. Functioning.*

(1) *First stage (arming).*

(a) The first application of pressure on the tilt rod by a tank or vehicle depresses the pressure piece which, in turn, transmits the pressure through the steel ball and its supporting flexible rods to the sliding cylinder. The sliding cylinder is depressed against the compression spring until it contacts the base ring. The steel ball is forced through the flexible rods, until it drops down on top of the pressure head of the fuze. Further pressure has no effect since the steel ball is no longer in contact with the pressure piece.

(b) When pressure is released after the vehicle has passed, the compression spring returns the sliding cylinder and tilt rod to their original positions, and the increased side clearance allows the ball to roll under the lip of the sliding cylinder. The assembly is now armed (fig. 43).

(2) *Second stage (firing).* Any additional pressure against the tilt rod, after the mechanical-delay tilt assembly has been armed, is transmitted through the steel ball directly to the pressure head of the fuze, depressing the pressure head and firing the fuze.

*d. Installing and Arming.*

- (1) Remove the prongs from an S-mine fuze 35 or the pressure cap from a pressure fuze 35B and remove their safety pins.
- (2) Fit the mechanical-delay tilt assembly over the fuze and secure it to the fuze case by tightening the mounting screws.



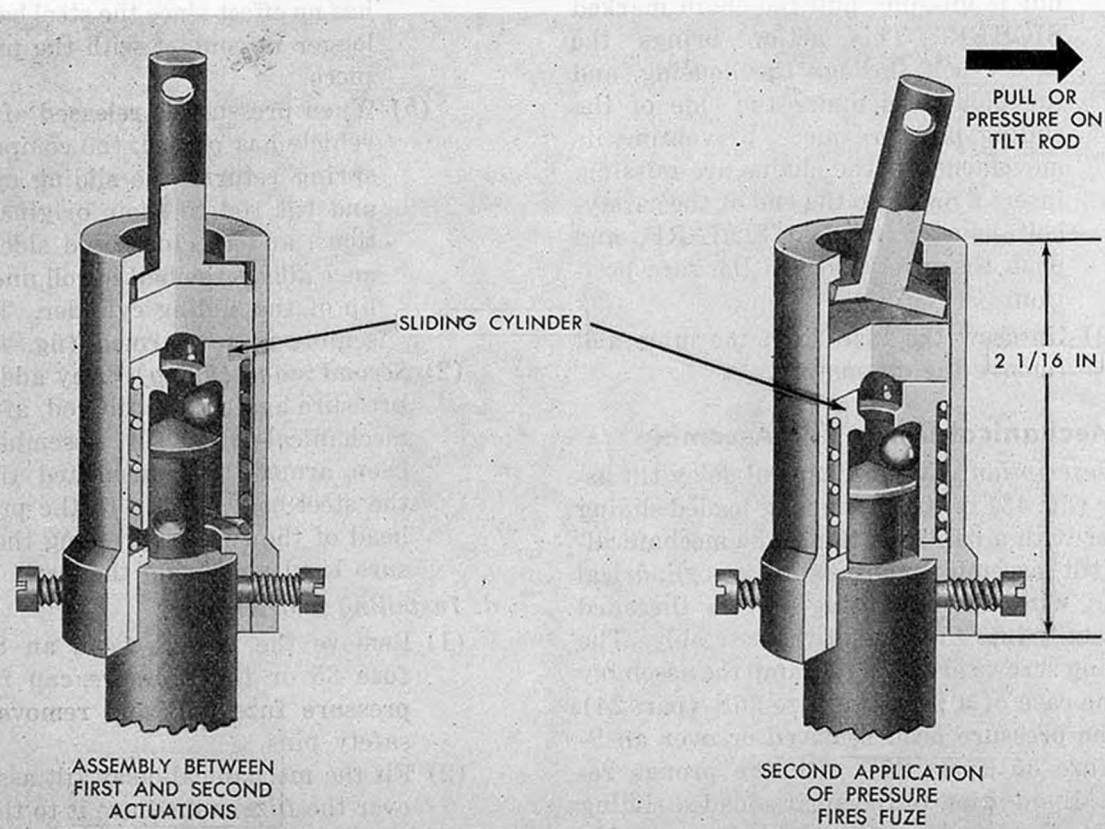
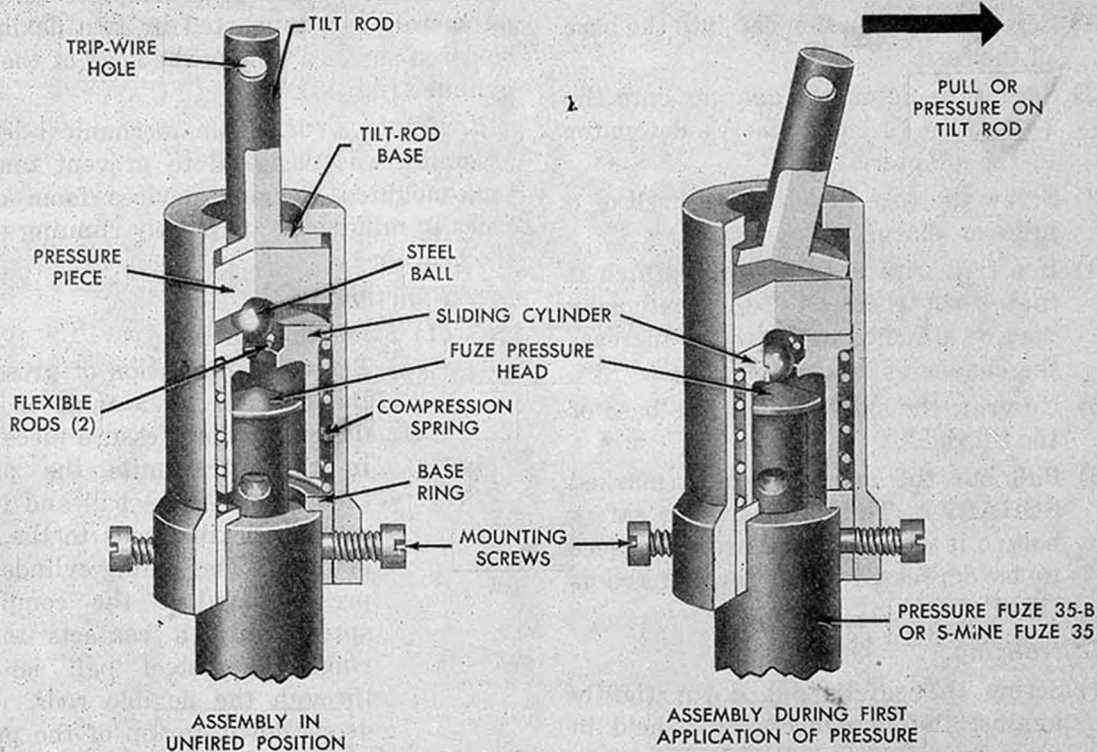


Figure 43. Operation of the mechanical-delay tilt assembly.

- (3) Screw this fuze with the attached mechanical-delay tilt assembly into the mine, after inserting a detonator into the fuze well of the mine.
- (4) Carefully attach a slack trip wire to the tilt rod, if desired.
- (5) Cover the mine and mechanical-delay tilt assembly so that only the short tilt rod shows above the ground.

*e. Neutralizing.*

- (1) Cut the trip wires if any.
- (2) Loosen the mounting screws at the

base of the mechanical-delay tilt assembly and lift the assembly carefully off the fuze.

- (3) Insert a nail or other suitable safety pin into the safety-pin hole of the fuze.
- (4) Unscrew the fuze from the mine.
- (5) Remove the percussion cap from the fuze.

*Note.* In neutralizing the mechanical-delay tilt assembly, be extremely careful not to touch the tilt rod until the assembly is lifted off the fuze. The assembly has no safety device.

## Section V. PULL, PRESSURE, TENSION-RELEASE FUZE

### 41. General

The only German fuze to function by either pull, pressure, or tension release is the pull fuze 42 (par. 42). It was adapted from the Soviet MUV fuze described in TM 5-223 A.

### 42. Pull Fuze 42 (Zugzünder 42; Z.Z. 42)

*a. Description.* The pull fuze 42 (fig. 44) is an instantaneous, mechanical type containing a spring-loaded striker. This fuze has either a bakelite, aluminum, or steel case  $3\frac{1}{2}$  inches long and  $\frac{1}{2}$  inch in diameter. The striker is held in the cocked position by a winged striker-retaining pin which passes through the striker shaft, flush with the top of the fuze case. A trip-wire hole for anchoring a trip wire is located at the end of the striker shaft. The base of the fuze is threaded on the outside.

*b. Employment.* This fuze is used principally in the Schü'mine 42 (par. 92), the bar mine 43 (par. 66), and the wooden-box mine 42 (par. 71). Other mines using this fuze are the Sprengriegel 8 kilogram (par. 67), the wooden-box mine V.B. (par. 72), the Schnellmine A (par. 73), the Finnish ice mine (par. 101), the clay mines (pars. 76 and 98), the shell mine (par. 81), the concrete stake mine (par. 87), and certain improvised mines and booby traps. In most of these mines the fuze operates by pressure on the mine lid or on a pressure board which pushes the striker-retaining pin out of the striker shaft of the fuze.

*c. Functioning.* This fuze will function under any one of the three following initiating forces:

- (1) *Pressure.* Pressure of from 6 to 11 pounds on the wings of the striker-retaining pin pushes the pin out of the striker shaft, releasing the spring-loaded striker against the percussion cap firing the detonator.
- (2) *Pull.* A pull of from 6 to 11 pounds on a trip wire attached to the trip-wire loop in the striker-retaining pin pulls out the pin and releases the striker against the percussion cap firing the detonator.
- (3) *Tension release.* With the striker-retaining pin removed, cutting or breaking a taut trip wire attached to the trip-wire hole in the striker shaft releases the striker against the percussion cap firing the detonator.

*d. Installing and Arming.*

- (1) *Pressure.* Screw the fuze, with detonator, into the mine or charge. The wings of the striker-retaining pin must be horizontal and below the striker shaft.
- (2) *Pull.* Screw the fuze, with detonator, into the mine or charge, and attach a slack trip wire to a stake or bush and the other end to the loop of the striker-retaining pin.
- (3) *Tension release.* Screw the fuze, with detonator, into the mine or charge. Attach a taut trip wire to a stake or bush and the other end to the hole in the end of the striker shaft. Then remove the striker-retaining pin with

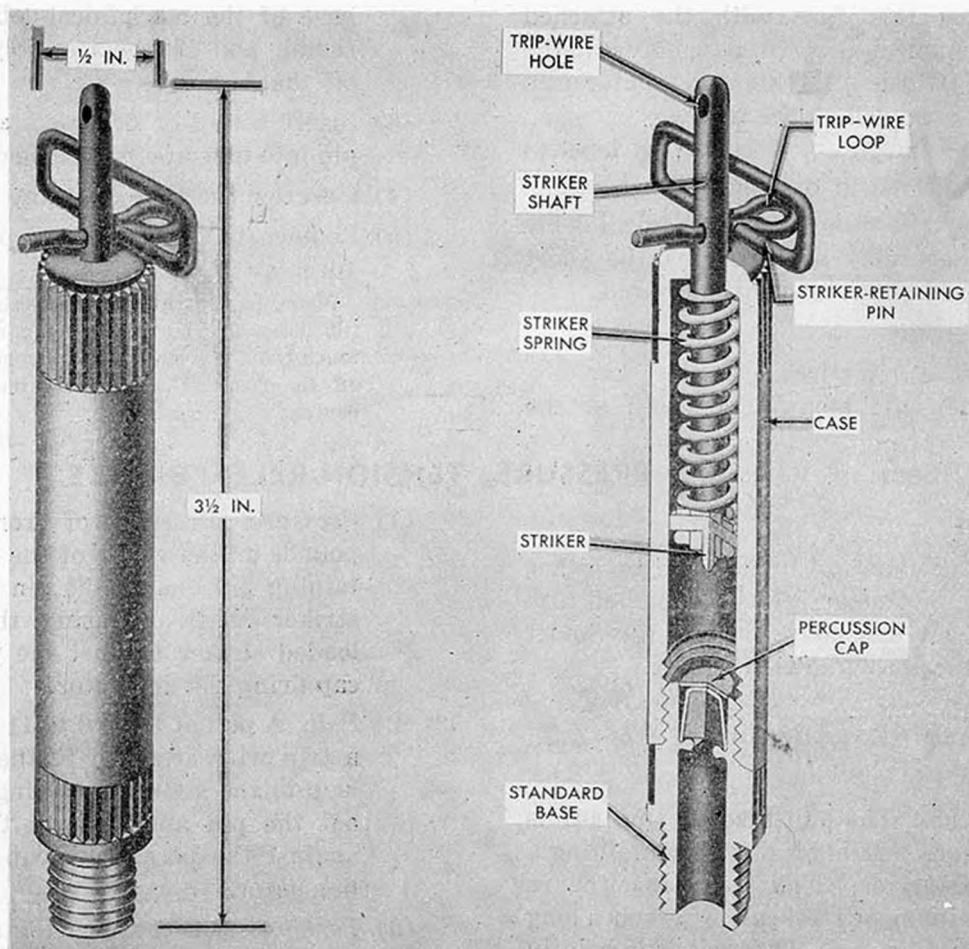


Figure 44. Pull fuze 42.

a 50-yard length of wire or rope from a sheltered position.

*Note.* When the fuze is to be used for pull or tension release, the mine or charge must be securely staked down.

*e. Neutralizing.*

- (1) *When set for pressure.* Unscrew the fuze from the mine, and remove the detonator from the fuze.

- (2) *When set for pull.* Cut the slack trip wire, unscrew the fuze from the mine, and remove the detonator from the fuze.

- (3) *When set for tension release.* First insert a nail or wire into the hole for the striker-retaining pin. Then cut the taut trip wire and remove the detonator from the fuze.

## Section VI. PULL FUZES

### 43. General

Pull fuzes are divided in two groups, according to the manner in which they function internally. Fuzes in the first group have spring-loaded strikers. They are normally used in antipersonnel mines, activated antitank mines, and booby traps. Fuzes in the second group have coiled pull wires in a chemical compound.

They are normally used to fire hand grenades and to light time fuzes.

### 44. Pull Fuze 35 (Zugzünder 35; Z.Z. 35)

*a. Description.* The pull fuze 35 (fig. 45) consists of a cylindrical brass case containing a spring-loaded striker held by two striker-re-



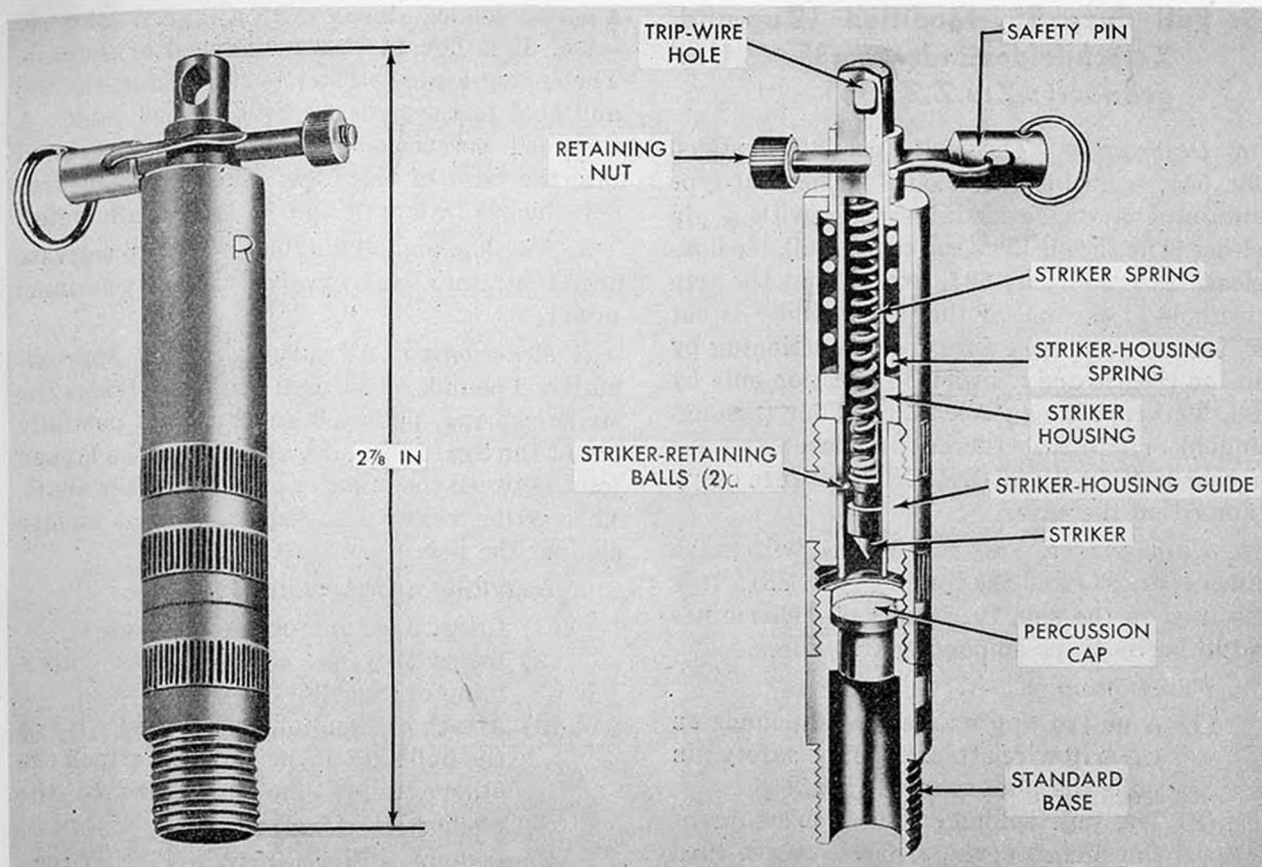


Figure 45. Pull fuze 35.

taining balls and a safety pin. The striker is cocked inside a hollow, cylindrical, spring-loaded striker housing two striker-retaining balls. A percussion cap is located in the base of the fuze. The fuze is  $2\frac{7}{8}$  inches long.

*b. Employment.* This fuze is used with stake mines (par. 87), the S-mine 35 (par. 85), and the Schü'mine 44 (par. 93). It is also used for activating Tellermines and for booby traps employing trip wires. The fuze is provided with a standard base which fits all standard fuze wells in charges, grenades, and mines.

*c. Functioning.*

- (1) After the safety pin has been removed, a pull of from 9 to 13 pounds on the trip wire moves the striker housing outward, compressing the striker-housing spring.
- (2) The two striker-retaining balls are forced outward as they clear the striker-housing guide, releasing the spring-loaded striker.

- (3) The released striker, driven by the striker spring, fires the percussion cap and the detonator.

*d. Installing and Arming.*

- (1) Insert a standard detonator into the base of the fuze.
- (2) Screw the fuze into a mine or charge.
- (3) Attach a slack trip wire, first to an anchor (stake or tree) and then to the fuze.
- (4) Unscrew the retaining nut from the end of the safety pin and remove the safety pin.

*e. Neutralizing.*

- (1) Insert the safety pin, a wire, or nail, in the safety-pin hole.
- (2) Remove the trip wire.
- (3) Remove the fuze and the detonator from the mine or charge.
- (4) Remove the detonator from the fuze.

- f. Packing.* Ten fuzes are packed in a tin box.

#### 45. Pull Fuze 35, Modified (Zug-und-Zerschneidezünder 35 Umgeändert; Z.u.Z.Z. 35)

a. *Description.* The pull fuze 35 modified (fig. 54), is an instantaneous, mechanical type containing a spring-loaded striker with a pin release. The fuze is identical to the pull, tension-release fuze 35 (par. 53), except that the trip wire hole at the end of the pull cylinder is cut off. This prevents the fuze from functioning by tension release and allows it to function only by pull. This fuze is also called Zugzünder (Schlagzünder) or pull fuze (percussion fuze) and has the words NUR ZUGZÜNDER (pull fuze only) stamped on the case.

b. *Employment.* This fuze is used with stake mines (par. 87) and the S-mine (par. 85). It is also used in the side fuze wells of Tellermines and in booby traps employing trip wires.

c. *Functioning.*

- (1) A pull of approximately 40 pounds on the trip wire attached to the safety pin pulls the pin out of the fuze.
- (2) The pull cylinder, under pressure of the main spring, moves downward until the striker-retaining pins escape into the lower recess, releasing the spring loaded striker against the percussion cap firing the detonator.

d. *Installing and Arming.*

- (1) Insert a detonator into the base of the fuze.
- (2) Screw the fuze into a mine or charge.
- (3) Attach a slack trip wire to an anchor and to the safety-pin ring.
- (4) Unscrew the retaining nut from the end of the safety pin.

e. *Neutralizing.*

- (1) Cut any slack trip wires.
- (2) Wire or tape the safety pin securely in place.
- (3) Unscrew the fuze from the mine.
- (4) Remove the detonator from the fuze.

f. *Packing.* Sixteen fuzes are packed in a tin box.

#### 46. Pull Fuze Z.Z. (Zugzünder)

a. *Description.* The pull fuze Z.Z. (fig. 46) is an instantaneous, mechanical fuze containing

a spring-loaded striker with a lapped joint release. It is housed in a cylindrical brass case. The spring-loaded striker is recessed at the top and held to the pull cap by a lapped joint. A threaded percussion-cap assembly is screwed into the base of the fuze. The fuze measures  $3\frac{7}{16}$  inches in length and  $\frac{1}{2}$  inch in diameter.

b. *Employment.* This fuze is used to activate antitank mines, booby traps, and antipersonnel mines.

c. *Functioning.* An outward pull of approximately 3 pounds on the pull ring compresses the striker spring, pulls the striker shaft partially out of the top of the fuze, and shears the lapped joint between the pull cap and the striker shaft. This action releases the spring-loaded striker against the percussion cap.

d. *Installing and Arming.*

- (1) Insert a detonator into the fuze.
- (2) Insert the fuze and detonator into a mine or charge.
- (3) Attach one end of a slack trip wire to the pull ring of the fuze and attach the other end of the trip wire to the anchor.

e. *Neutralizing.* Since this fuze is not provided with a safety device, the mine or charge should be destroyed in place.

**Caution:** Care must be taken when tying a trip wire to the pull ring not to exert any pull on the ring since the fuze will function when approximately 3 pounds of pull are exerted on the pull ring.

#### 47. Pull Fuze For Egg Grenades, (Brennzünder Ei; B.Z.E.)

a. *Description.* The pull fuze for egg grenades consists of two types, the friction type and the spring-loaded type.

- (1) *Friction type.* The friction type pull fuze (fig. 47) is a delay, friction, chemical type. It is housed in a cylindrical metal case containing a coated pull wire leading through, and coiled below, a chemical compound. The fuze is  $2\frac{1}{8}$  inches long and  $\frac{7}{16}$  of an inch in diameter. A delay pellet may be screwed onto the base of the fuze. A round, knob-shaped pull cap is screwed onto the top of the fuze and is attached by

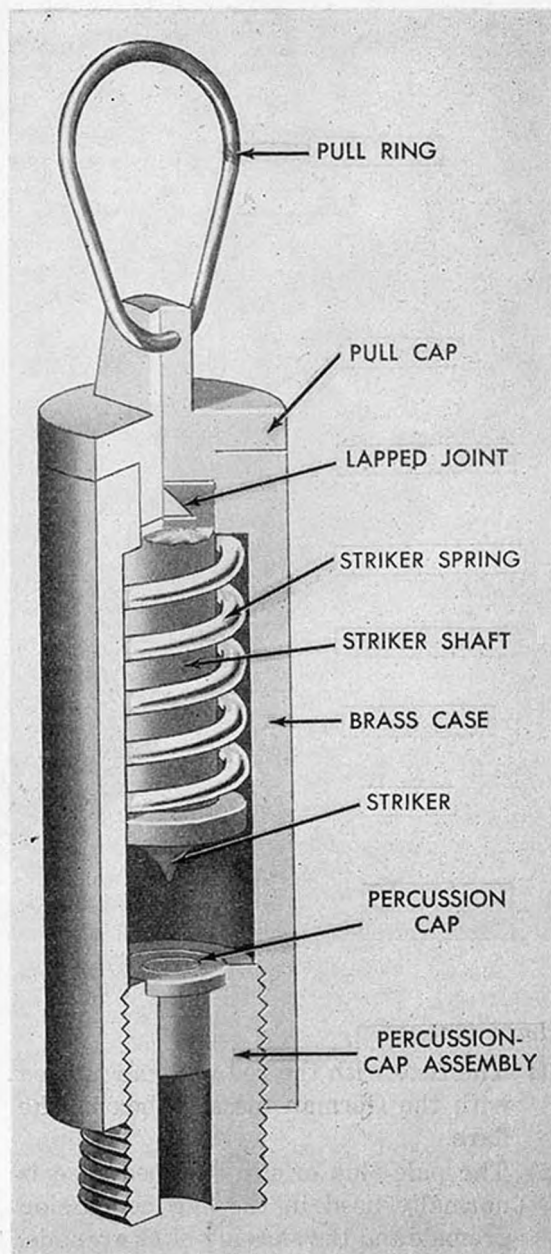
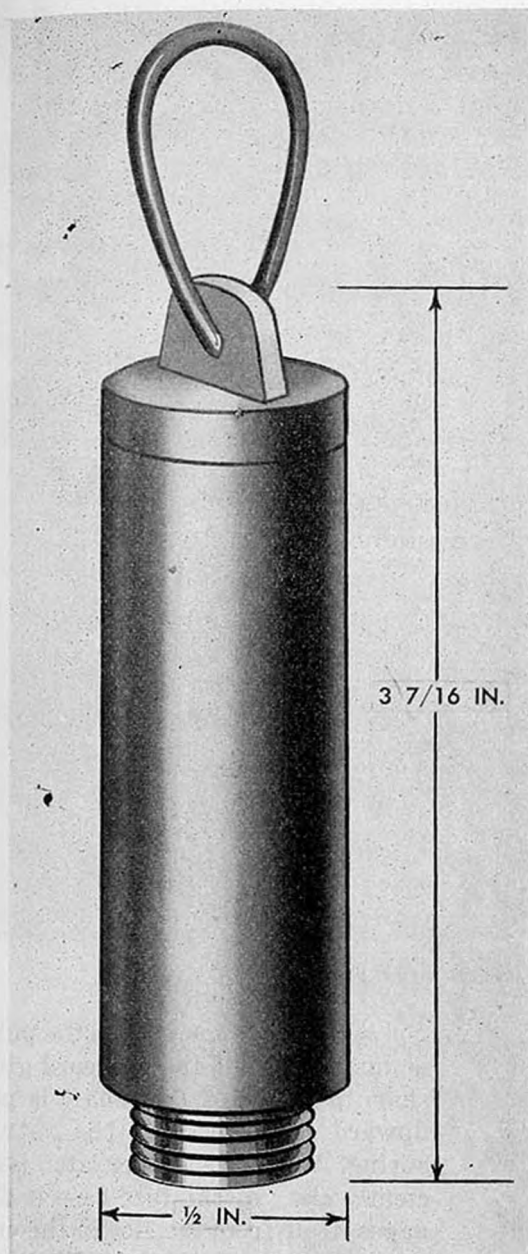


Figure 46. Pull fuze Z.Z.

a pull disk and a pull cord to the coated pull wire. The pull cap of the fuze may be painted one of four colors, indicating the length of the delay time, in seconds, of the delay pellet:

Red: 1-second delay.

Gray or pale blue:  $4\frac{1}{2}$ -second delay.

Yellow:  $7\frac{1}{2}$ - to 9-second delay.

White: 10-second delay.

A hexagonal nut is normally screwed onto the top of the fuze, below the pull

cap. Some models, however, are provided with a wing-shaped nut (fig. 48) with the wings pointing upward.

- (2) *Spring-loaded type.* The spring-loaded type pull fuze (fig. 48) is identical to the friction type externally. It differs internally in that it contains a flat, metal spring-loaded striker, and the fuze usually has a wing-shaped nut screwed on the top. The pull cap of the mechanical fuze is colored a deep blue.



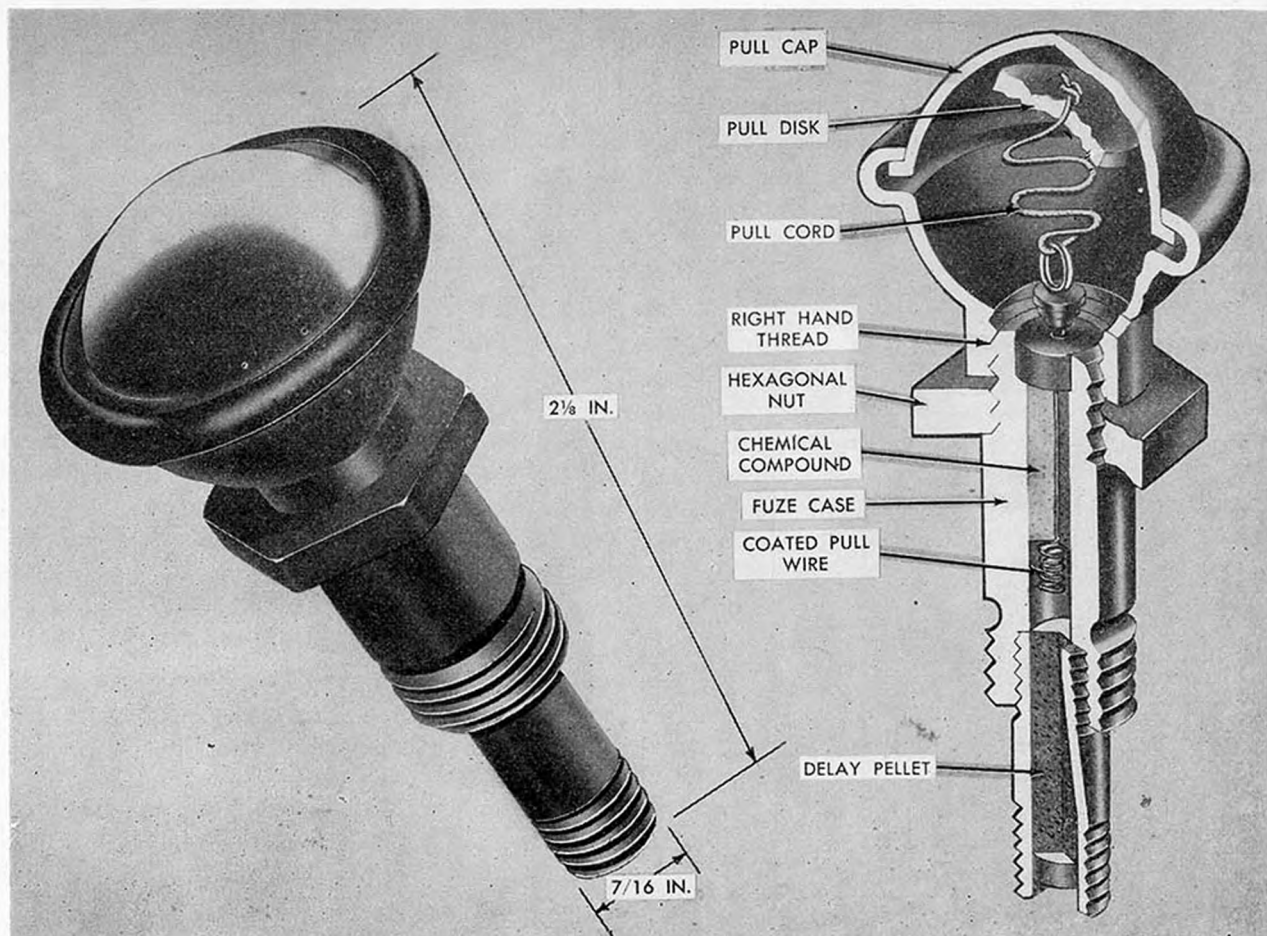


Figure 47. Friction type pull fuze for egg grenades.

*b. Employment.*

- (1) The fuze with the red pull cap is used with the German message-box smoke flare.
- (2) The pale-blue or gray-capped fuze is normally used in the egg concussion grenade and the shaving-stick grenade.
- (3) The yellow- and white-capped fuzes are used in hollow or prepared charges.
- (4) The fuze with the deep-blue colored pull cap is normally used in the egg concussion grenade.

*c. Functioning.*

- (1) *Friction type.* When the pull cap is unscrewed and the pull cord given a sharp pull, the coated pull wire is pulled through and ignites the chemical compound. The flame ignites the powder in the delay pellet which then fires the detonator.

- (2) *Spring-loaded type.* When the pull cap is unscrewed and the pull cord given a sharp pull, the striker shaft is pulled upward compressing the striker spring. When the striker latch is sufficiently clear of the fuze case it disengages itself from the slot in the end of the striker shaft, releasing the striker against the percussion cap. The exploding percussion cap ignites the powder in the delay pellet which, in turn, fires the detonator.

*d. Installing and Arming.* Before using these fuzes, make sure the delay pellet is in the base of the fuze and has not been burned out. These fuzes all have right-hand threads on the pull caps to differentiate them at night from the fuse lighter 39 (par. 49), which has left-hand threads. Trip wires may be attached to the pull caps of these fuzes.

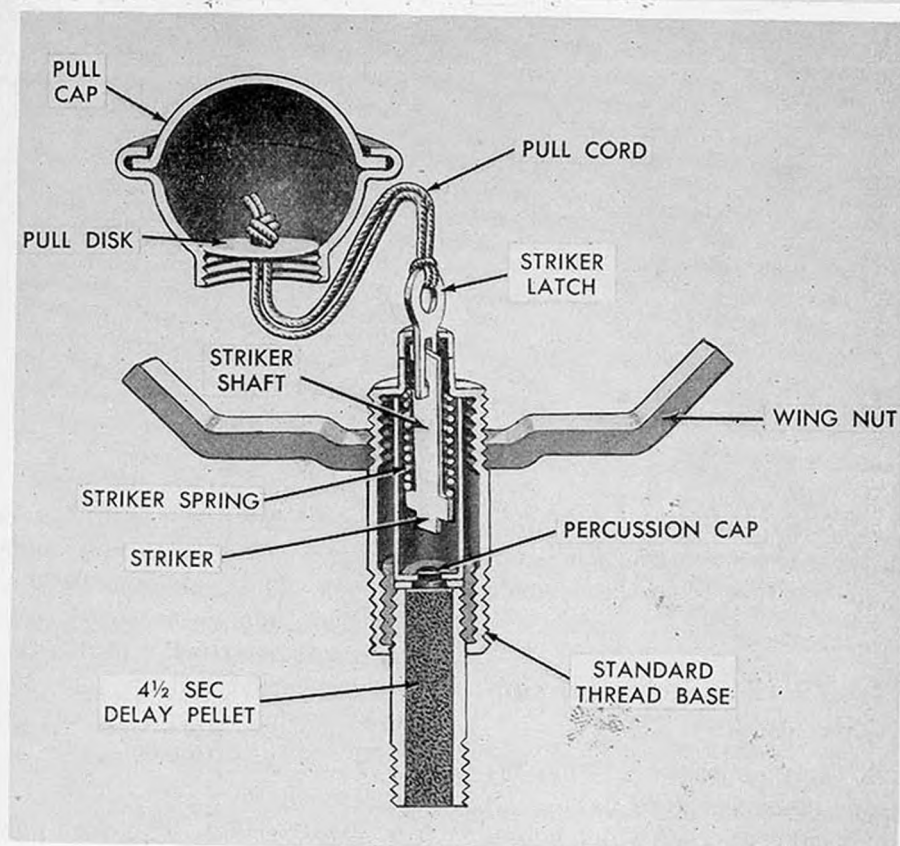
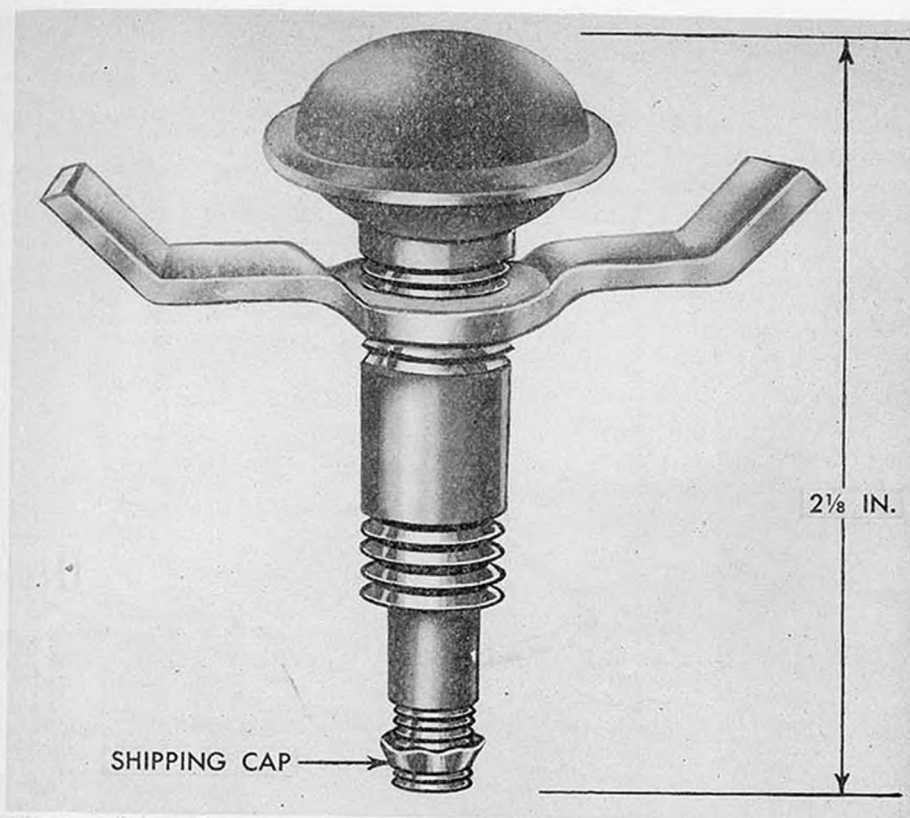


Figure 48. Spring-loaded type pull fuze for egg grenades.

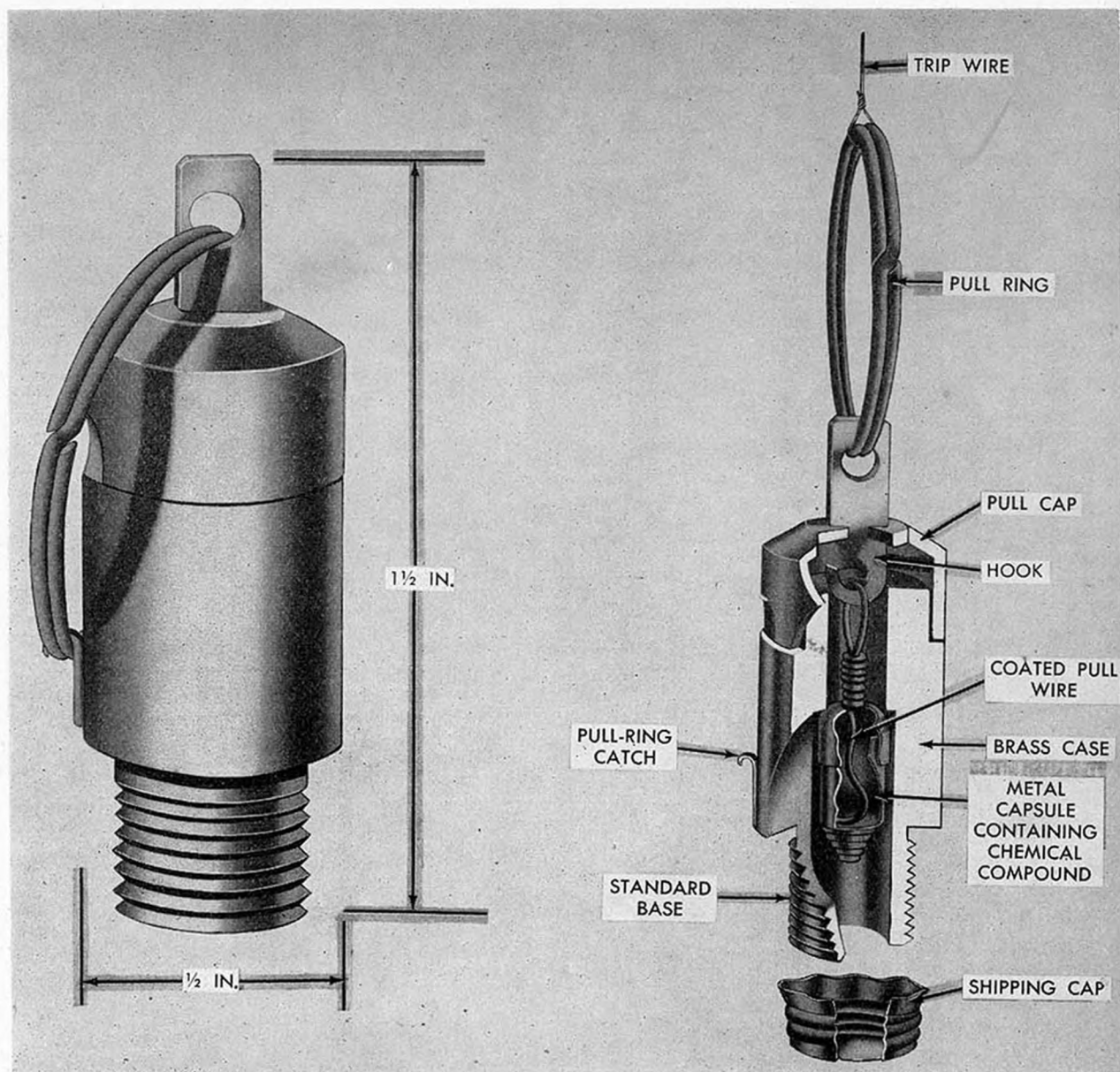


Figure 49. Fuse lighter 29.

*e. Neutralizing.* Since there are no safety devices on any of these fuzes neutralization consists of unscrewing the fuze from the grenade or charge.

#### 48. Fuse Lighter 29 (Zündschnuranzünder 29; Zdschn. Anz. 29)

*a. Description.* The fuse lighter 29 (fig. 49) is an instantaneous, chemical fuse lighter. It consists of a cylindrical brass case which houses a metal capsule containing a chemical com-

pound. Running through the chemical compound is a coated pull wire, which is attached to a hook. The hook is soldered to the pull cap which, in turn, is fastened to the pull ring. There is no delay pellet in this fuse lighter. The pull ring is normally held to the fuse lighter case by a small metal pull-ring catch. The fuse lighter is  $1\frac{1}{2}$  inches long and  $\frac{1}{2}$  inch in diameter.

*b. Employment.* This fuse lighter is used to light time fuse attached to a prepared charge or



hollow charge. It may also be used to ignite a smoke candle or, with a trip wire attached to the pull ring, as a fuze for a booby trap, activated antitank mine, or improvised mine.

*c. Functioning.* As the pull ring is pulled out sharply, the pull cap together with the attached hook is separated from the brass case. As the coated pull wire, which is attached to the hook, is pulled through the metal capsule, the chemical compound ignites. The flame ignites the powder-train of the fuse at the base of the fuse lighter.

*d. Installing and Arming.*

- (1) Unscrew the shipping cap.
- (2) Insert a length of time fuse into a fuse adapter and screw the fuse adapter onto the base of the fuse lighter.
- (3) Insert the other end of the time fuse into a detonator adapter.
- (4) Insert the detonator into the detonator adapter.

- (5) Screw the detonator adapter into the charge.
- (6) Disengage the pull ring from the pull-ring catch.
- (7) Tie one end of a slack trip wire to an anchor and the other end to the pull ring of the fuse lighter.

*e. Neutralizing.*

- (1) Cut the time fuse near the base of the fuse adapter of the fuse lighter 29.
- (2) Cut any slack trip wires.
- (3) Fasten the pull ring, by means of the pull-ring catch, to the side of the fuse lighter case.
- (4) Unscrew the fuse adapter from the fuse lighter and remove the time fuse.

## 49. Fuse Lighter 39 (Zündschnuranzünder 39; Zdschn. Anz. 39)

*a. Description.* The fuse lighter 39 (fig. 50)

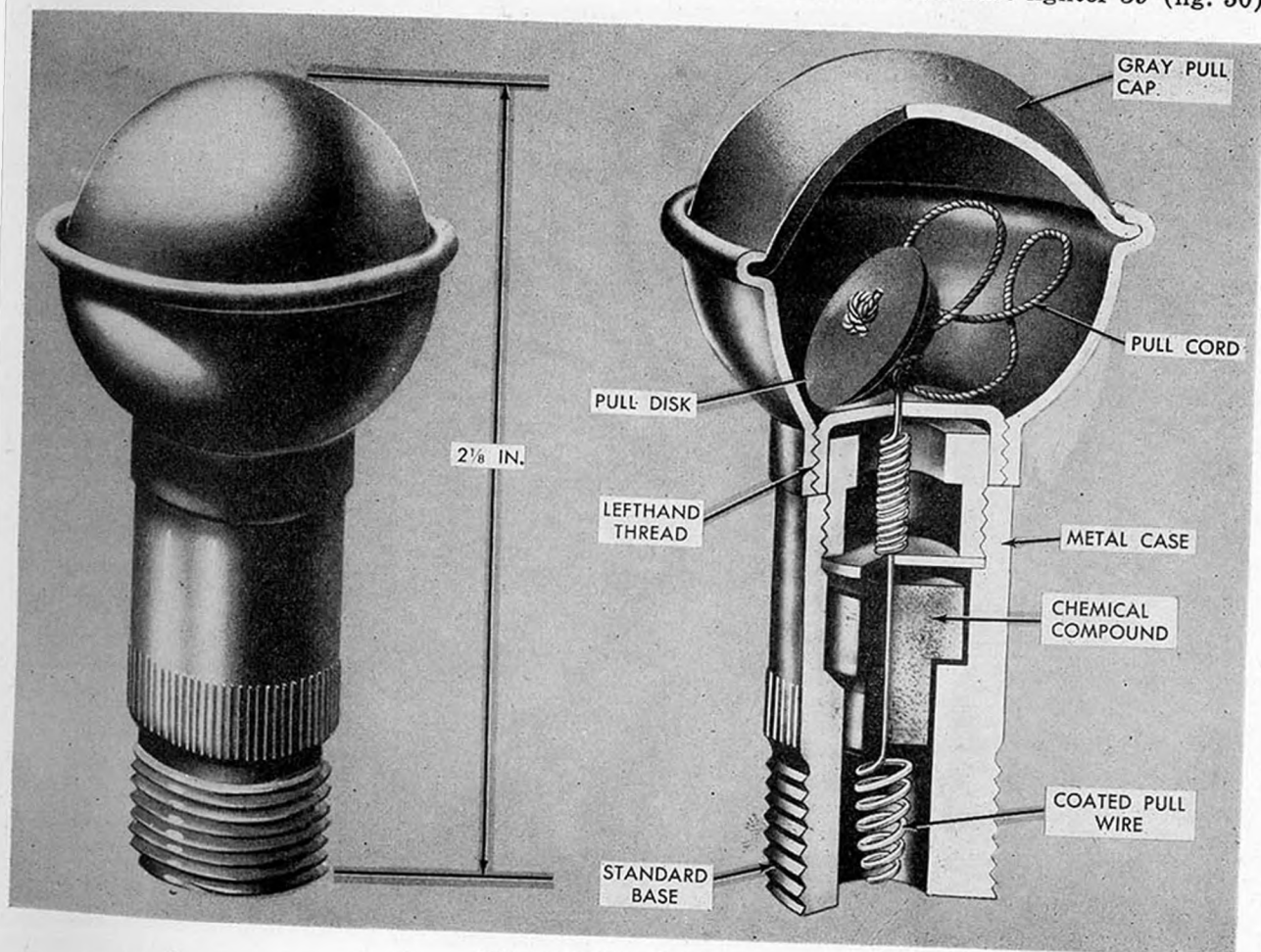


Figure 50. Fuse lighter 39.

is an instantaneous, chemical fuse lighter with a coated pull wire. Externally, this fuse lighter resembles the pull fuze for egg grenades, but lacks the hexagonal or the wing-shaped nut and the delay pellet. The gray pull cap of the fuse lighter 39 is left-hand threaded to differentiate it from the pull fuze for egg grenades. The fuse lighter is  $2\frac{1}{8}$  inches long.

*b. Employment.* This fuse lighter is used to light a time fuse attached to a prepared charge or hollow charge. It may also be used to ignite a smoke candle or, with a trip wire attached to the pull cap, as a fuze for a booby trap, activated antitank mine, or improvised mine.

*c. Functioning.* When the pull cap is unscrewed and given a sharp pull, the pull cord attached to the coated pull wire pulls the coated pull wire through the chemical compound and ignites it. The flame travels down through the threaded base and ignites the time fuse.

*d. Installing and Arming.*

- (1) Insert a length of time fuse into an adapter and screw the adapter onto the base of the fuse lighter.
- (2) Insert the other end of the safety fuse into a detonator adapter.
- (3) Insert a detonator into the detonator adapter.
- (4) Screw the detonator adapter into the charge.

*e. Neutralizing.*

- (1) Cut the time fuse near the base of the fuse lighter 39.
- (2) Unscrew the fuse adapter from the fuse lighter and remove the time fuse.

## 50. Friction Fuzes For Stick Grenades

Four models of friction fuzes were designed for use in the German stick grenades (potato-masher grenades). The friction fuze (B.Z. 24)

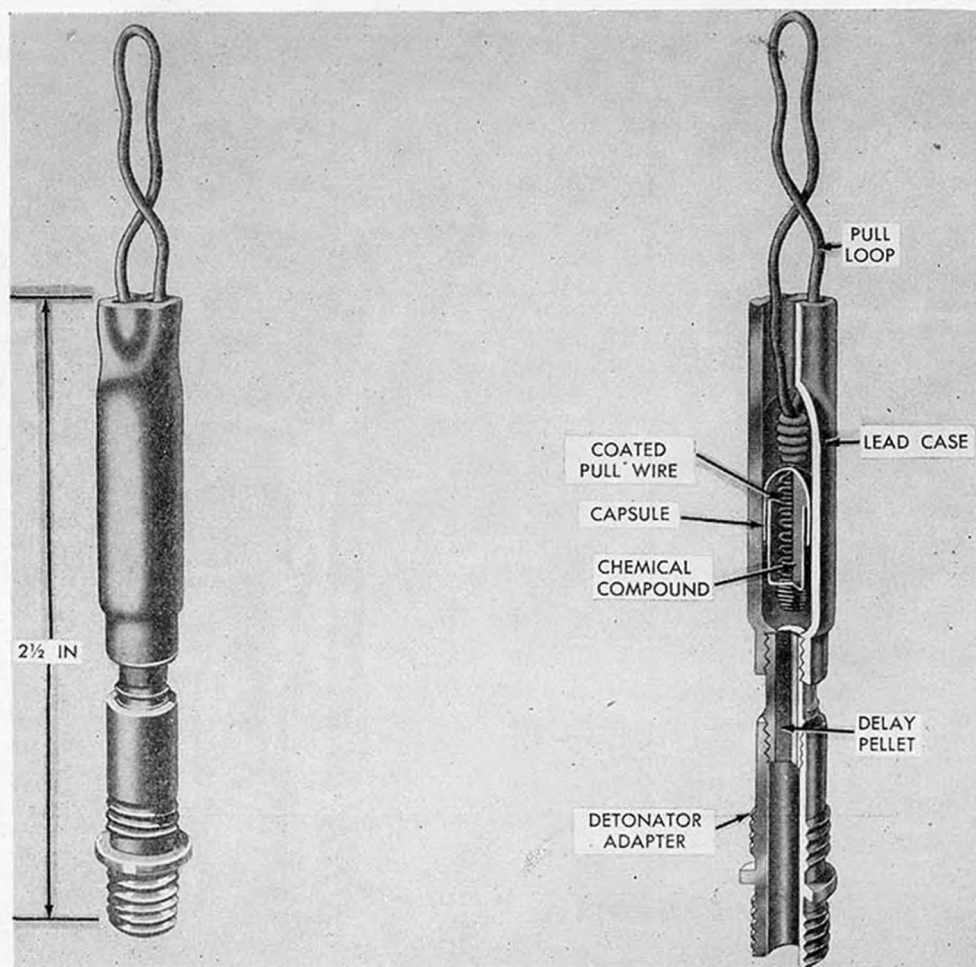


Figure 51. Friction fuze 24.

24 (fig. 51) and the friction fuze 39, modified (B.Z. 39 umg.) (fig. 52) were used in the stick concussion grenades. The friction fuze for smoke charges 38 (Nebel brennzünder 38; Nb. B.Z. 38) (fig. 52), and the friction fuze 39 (B.Z. 39) (fig. 52) were used in the stick smoke grenades. All four of these fuzes have a cylindrical, soft-metal case. All of them function by pulling a coated pull wire through a capsule filled with a chemical compound. Each fuze has a  $4\frac{1}{2}$ -second delay pellet screwed into its base, and each has a standard-thread detonator adapter screwed onto the base of the delay pellet. The friction fuzes 39 and 39 modified are later models of the friction fuze for smoke charges 38 and the friction 24, respectively. The friction fuzes for smoke charges 38 and the friction fuze 39 have a white ring painted around the case, near the base. The friction fuze 39 has five small holes in its threaded base. Figure 51 shows a cutaway view of the friction fuze 24. The internal construction of the other three fuzes is essentially the same.

## 51. Friction Fuze, West (Reibzünder, West)

*a. Description.* The friction fuze, West (fig. 53) is an instantaneous chemical type. The round brass case contains a pellet of chemical compound fastened to the end of a pull wire. The space between the pull wire and the inner wall of the case is filled with a chemical compound and is sealed at the lower end with a paper disk. The detonator is contained in a threaded detonator holder. The fuze is  $2\frac{7}{8}$  inches long and  $1\frac{1}{4}$  inches in diameter.

*b. Employment.* This fuze is used in improvised shell mines.

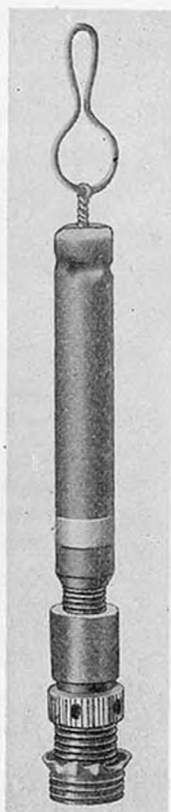
*c. Functioning.* A pull of 75 to 100 pounds on the pull wire draws the pellet through the chemical compound and ignites the flash composition which, in turn, fires the detonator.

*d. Installing and Arming.*

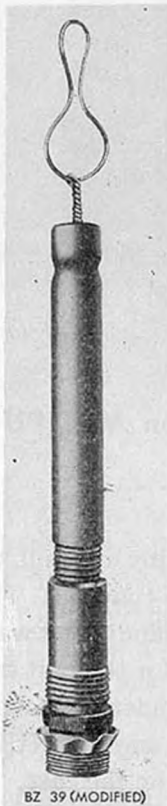
- (1) Screw the fuze into the fuze well of the mine.
- (2) Attach a slack trip wire to the pull wire on the fuze.

*e. Neutralizing.*

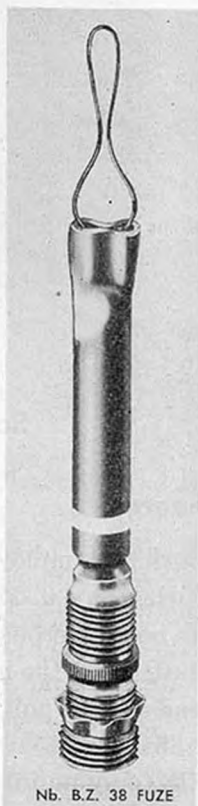
- (1) Cut the slack trip wire attached to the fuze.
- (2) Unscrew the fuze by gripping the top of the brass case.



B.Z. 39



BZ 39 (MODIFIED)



Nb. B.Z. 38 FUZE

Figure 52. Stick grenade fuzes.



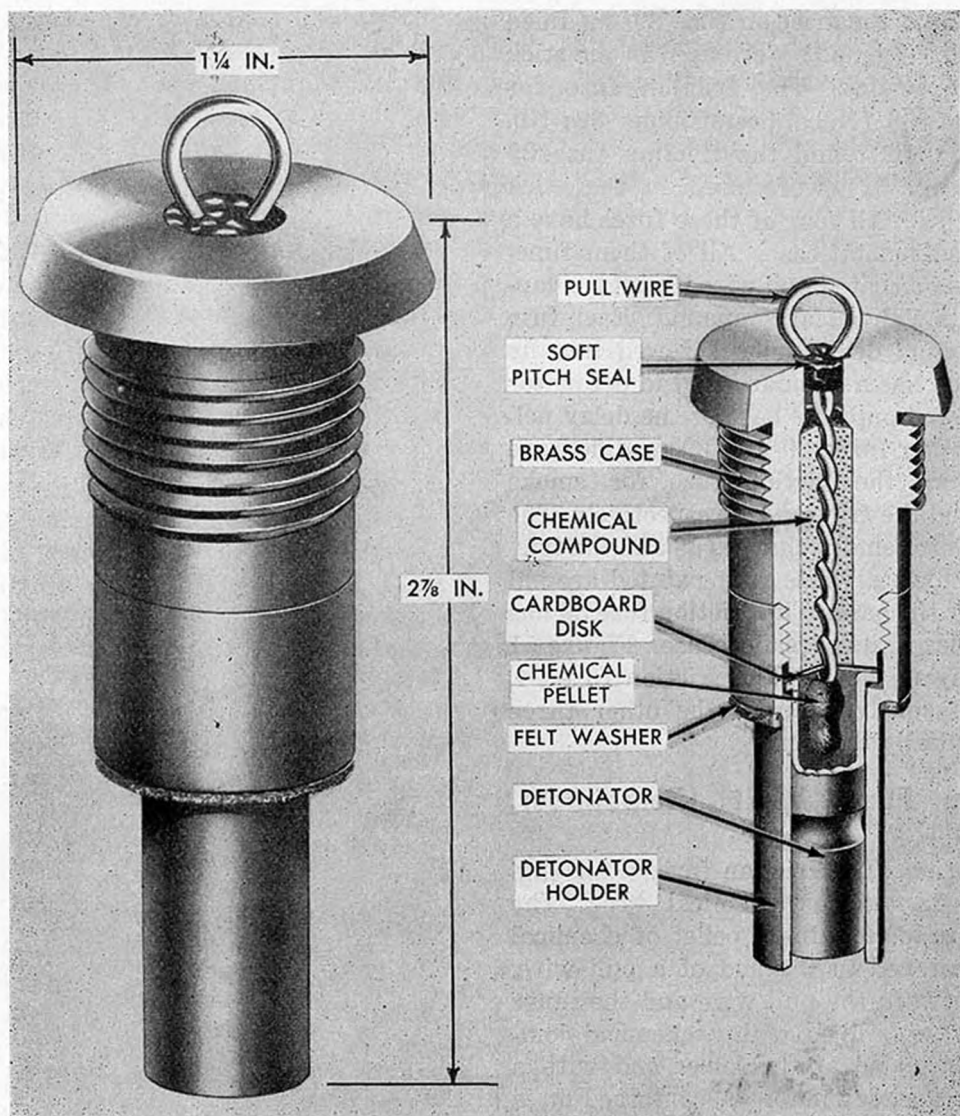


Figure 53. Friction fuze, West.

## Section VII. PULL, TENSION-RELEASE FUZES

### 52. General

The Germans employed only one pull, tension-release fuze, the Z.u.Z.Z. 35 (par. 53). This fuze proved to be dangerous to handle and was modified by cutting off the hole for the taut trip wire at the end of the pull cylinder. This modified Z.u.Z.Z. 35 (par. 45) was marked NUR ZUG-ZÜNDER (only pull fuze) on the case. It operated by the withdrawal of the safety pin which had a trip wire attached.

### 53. Pull Tension-Release Fuze 35 (Zug- und-Zerschneidezünder 35; Z.u. Z.Z. 35)

*a. Description.* The pull, tension-release fuze 35 (fig. 54) is an instantaneous, mechanical type. Externally, it closely resembles the pull fuze 35 (par. 44), except that the case is longer and the safety-pin projects through the pull cylinder flush with the top of the cylindrical brass case. The fuze is  $4\frac{3}{8}$  inches long. The cylindrical brass case contains a spring-loaded

striker held inside a spring-loaded pull cylinder by two striker-retaining pins. A brass collar at the top of the fuze encloses the pull cylinder and has two slots through which the safety pin is inserted. At the end of the pull cylinder, which projects above the top of the fuze, is a trip-wire hole. Just below the trip-wire hole is a safety-pin hole. The slots in the brass collar permit positioning of the pull cylinder for easy removal of the safety pin when the fuze is to be armed.

- (2) A pull of at least 9 pounds on the trip wire pulls out the pull cylinder, further compressing the main spring until the striker-retaining pins escape into the upper recess, releasing the spring-loaded striker against the percussion cap.

*d. Installing and Arming.*

- (1) Insert a detonator into the fuze.

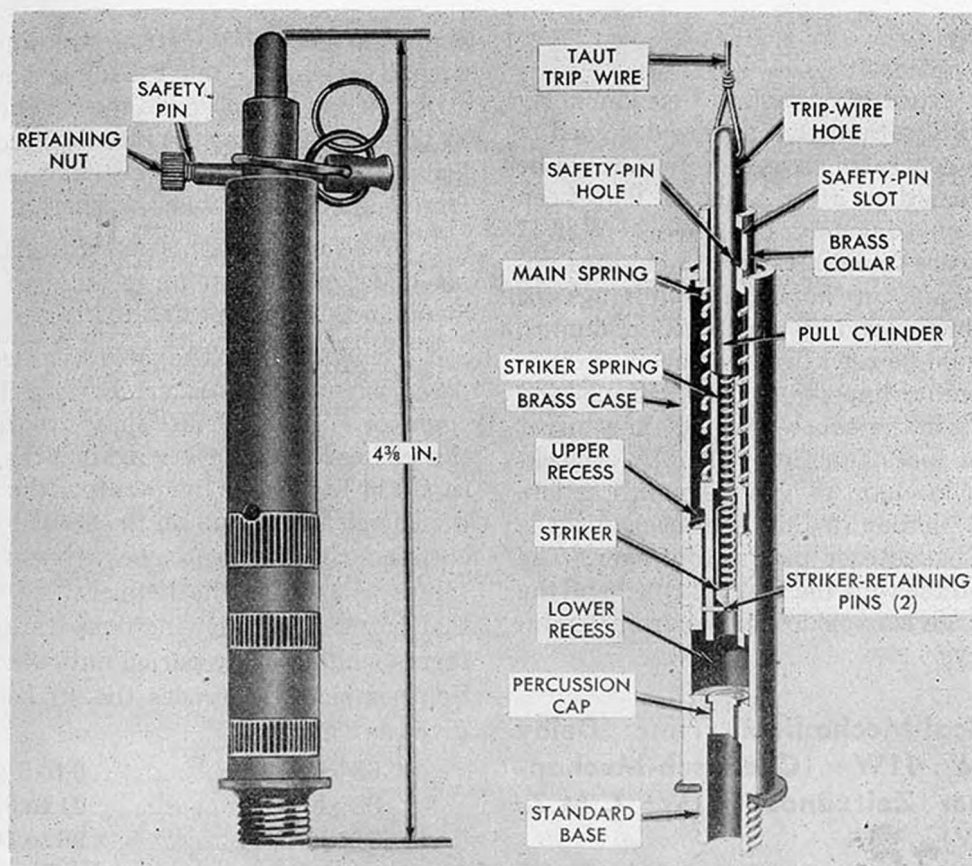


Figure 54. Pull, tension-release fuze 35.

*b. Employment.* This fuze is used with anti-personnel mines, improvised mines, booby traps, and activated antitank mines.

*c. Functioning.* When properly armed, this fuze functions when the taut trip wire is pulled or cut.

- (1) When the wire is cut, the pull cylinder, under pressure of the main spring, moves downward until the striker-retaining pins escape into the lower recess, releasing the spring-loaded striker against the percussion cap.

- (2) Screw the fuze into the mine or charge.
- (3) Anchor the taut trip wire.
- (4) Tie the loose end of the taut trip wire to the trip-wire hole in the end of the pull cylinder, adjusting the tension of the trip wire so the safety pin is positioned nearly in the center of the slots in the brass collar. If the safety pin bears against either end of the safety-pin slot, the pin cannot be readily withdrawn.
- (5) Unscrew the retaining nut on the

safety pin and withdraw the safety pin with a long piece of wire or cord.

*Note.* The Germans provided this fuze with an 8-inch tube of heavy cloth to cover the fuze and part of the trip wire. This allows the pull cylinder to move freely when the fuze is buried in the ground or among camouflaged materials.

*e. Neutralizing.*

- (1) Insert a pin or nail into the safety-pin hole through the safety-pin slot. Tape it in position.
- (2) Cut the taut trip wire after checking the anchor end.
- (3) Unscrew the fuze and remove the detonator.

## Section VIII. CLOCKWORK AND CHEMICAL DELAY FUZES

### 54. General

The three types of standard German delay fuzes described in this section were designed to be used with concealed charges which would be detonated sometime after an area had been given up to opposing forces. In World War II these fuzes were found attached to charges under bridge spans, in important buildings in cities and towns, and in ammunition dumps. The fuzes could be used by saboteurs to demolish strategically important installations and structures after the saboteurs had time to get away. These fuzes function either by a clockwork type of mechanism or by chemical action. They are all similar in that the mechanism is housed in a bakelite or plastic container. The lapse between the time the fuze is armed and the time the charge is exploded varies from 1 minute to 167 days.

### 55. Chemical-Mechanical Time Delay Fuze 41W (Chemisch-Mechanischer Zeitzünder 41W; C.M.Z. 41W)

*a. Description.* The chemical-mechanical time delay fuze 41 (fig. 55) is a delay, chemical, handset fuze containing a spring-loaded striker with a corrosive-neck release. It is 5½ inches long and 1¼ inches in diameter. The fuze consists of a cylindrical black bakelite case with a threaded arming cap and a combination brass percussion-cap-and-detonator holder screwed into the base of the fuze. Inside the upper part of the fuze is a glass ampoule containing acid. The glass ampoule rests on a bakelite, striker-retaining disk having four seep holes which pass through to the reaction chamber below. The spring-loaded striker is made of white metal

and is fastened to the striker-retaining disk by a small set screw. Only the upper portion of the striker shaft is exposed to the chemical reaction by the acid after it seeps into the reaction chamber. All other parts of the striker are protected from the acid by rubber washers.

*b. Employment.* This fuze is used for the delayed detonation of large charges in areas abandoned to an opposing force.

*c. Functioning.* The acid corrodes the exposed part of the striker shaft in the reaction chamber until the striker shaft breaks, releasing the spring-loaded striker against the percussion cap. The higher the temperature the more rapid the chemical reaction on the striker shaft. The chemical reaction ceases below -40° F, but resumes as soon as the temperature rises above that point. The following temperatures and the corresponding delay period until chemical reaction completely corrodes the striker shaft are given as a guide:

68° F	3 to 5¼ days
32° F	21 to 31 days
-31° F	96 to 167 days

#### *d. Installing and Arming.*

- (1) Remove the threaded arming cap and insert the glass ampoule of chemical, neck down, into the top of the fuze.
- (2) Screw on the arming cap until the top is felt to contact the top of the glass ampoule.
- (3) Insert a detonator into the base of the fuze and screw the fuze into the charge.
- (4) Screw the arming cap of the fuze on further until the glass ampoule breaks, causing the acid to seep down into the reaction chamber. The fuze is now



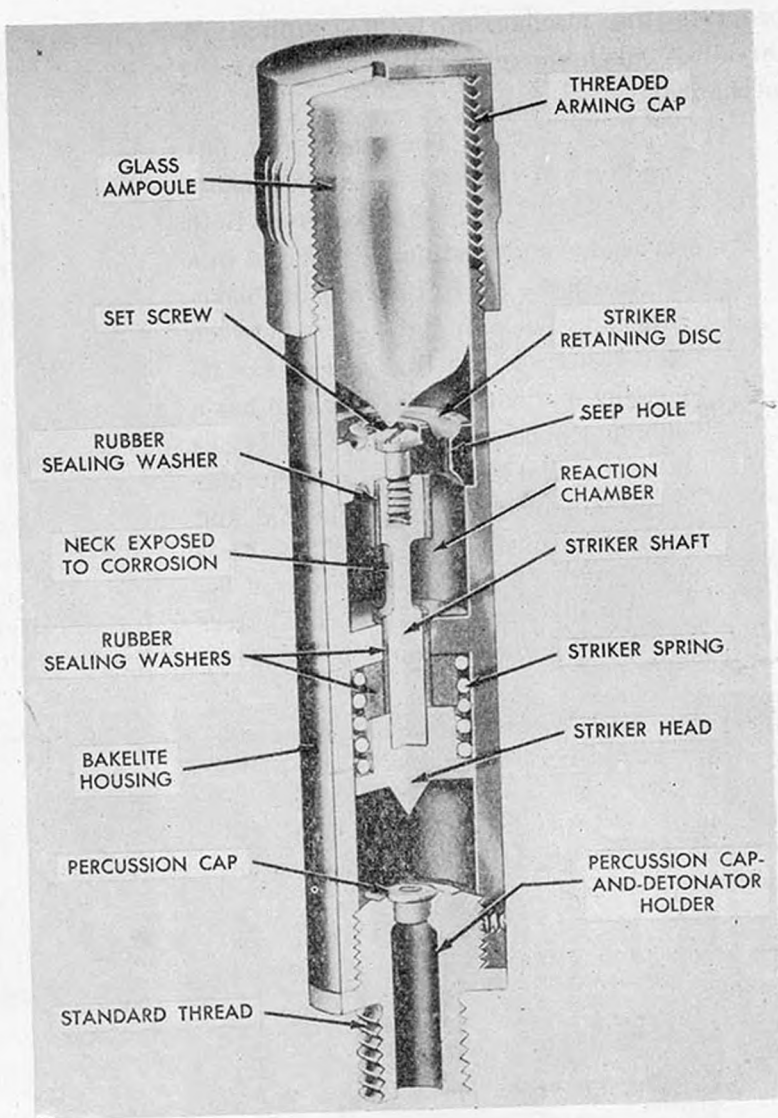
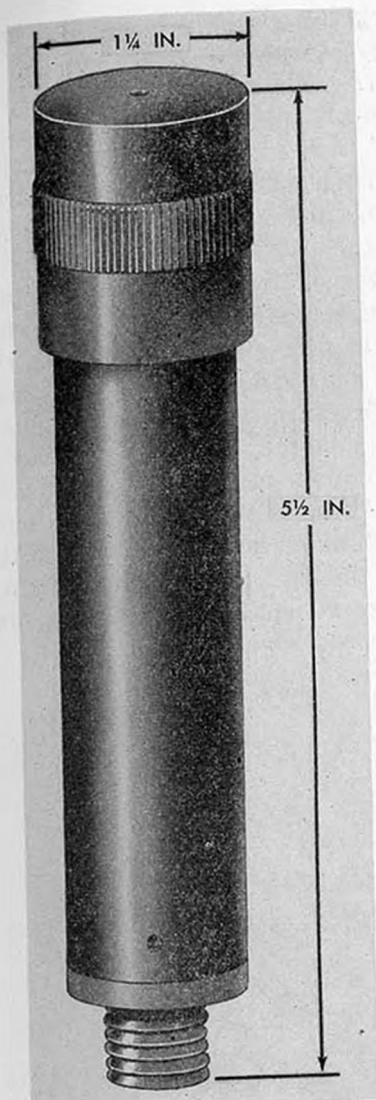


Figure 55. Chemical-mechanical time delay fuze 41W.

functioning, but it is safe to handle for at least 5 hours.

*e. Neutralizing.* If at all possible, any charge with this fuze should be blown in place. There is no safety device on this fuze, and it is impossible to know at what moment the striker shaft may break under the corrosive action of the acid. If it is necessary to neutralize the fuze, one man only should carefully unscrew it from the charge and remove the detonator.

*f. Packing.* The fuzes, with the ampoules but without the detonators, are packed eight to a cardboard carton.

## 56. 5-Minute Clockwork Delay Fuzes (*Zeitzündler für F; Zeitzündler für Sprüh Büchse 37*)

*a. Description.* Three types of the five-minute clockwork delay fuzes exist (figs. 56, 57, and 58). They are all similar. The fuze is a delay, mechanical type containing a spring-loaded striker with a clockwork release. It consists of a simple clockwork mechanism housed in a cylindrical bakelite case. The fuze has a time indicator, graduated in minutes, on the front and a winding post in the back. The time indicator can be turned to any of the desired number of minutes, up to 5. A safety pin, when in place,

prevents the mechanism from running. A threaded bakelite cap permits access to the mechanism.

- (1) *Types I and II.* The type I (fig. 56) and type II (fig. 57) fuzes are 3 inches long and 1½ inches in diameter. Both types have a winding key carried in a recess in the top of the threaded bakelite cap. The only differences between the two fuzes are that type I has its setting dial outside the case and has a double-looped safety pin. Type II has a setting dial inside the case, a circular glass window for viewing the dial, and a single-looped safety pin. Type I has the letters *Zt. Z. f. F.* on the front below the dial, and type II has the letters *Zt. Z. f. Sp. Bu. 37* below the glass set-

ting window. Both of these types have standard bases.

- (2) *Type III.* The type III fuze (fig. 58) is longer than types I and II, measuring 4½ inches in length and 1½ inches in diameter. The type III has an arming knob in the top of the fuze which can be turned to either *scharf* (armed) or *sicher* (safe). A safety pin prevents the shaft of the arming knot from turning and also prevents the striker shaft from moving. The base of the fuze does not have the standard-thread adapter, but has instead a spring clip on each side of the fuze to hold the fuze in the charge. An aluminum detonator holder screws into the base of the fuze. The winding key for this fuze is not attached to the fuze as in types I and II.

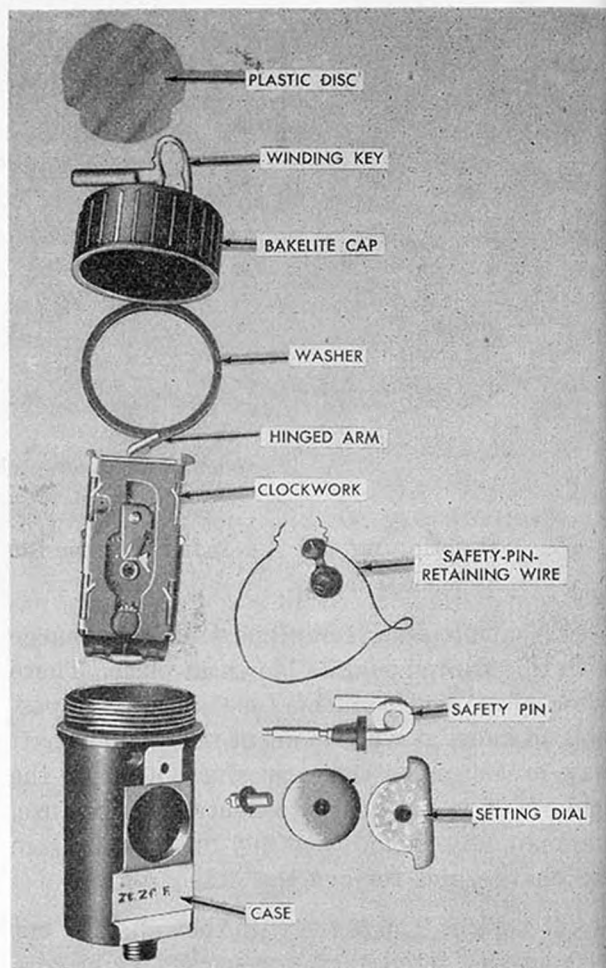
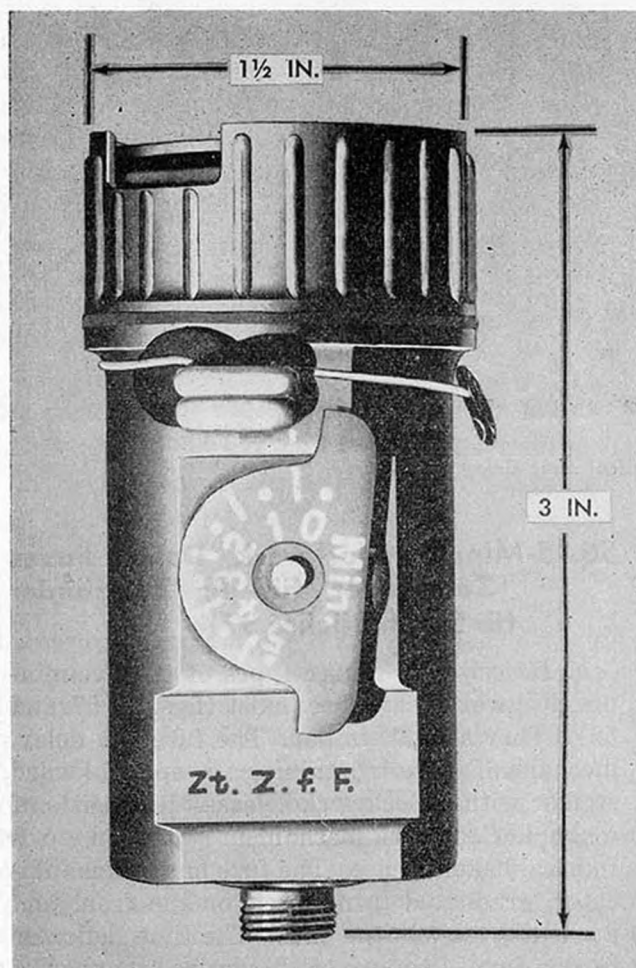


Figure 56. 5-minute clockwork delay fuze, type I.

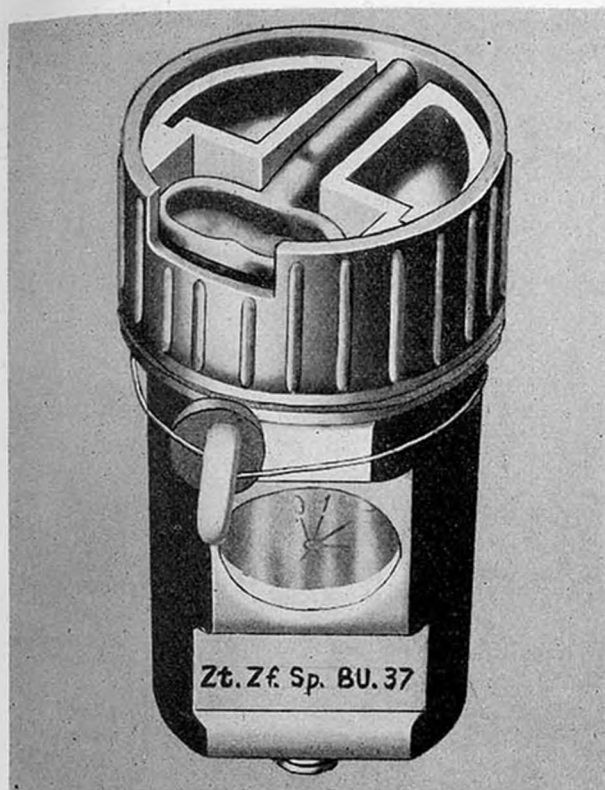


Figure 57. 5-minute clockwork delay fuze, type II.

b. *Employment.* The 5-minute clockwork delay fuzes are used in the bounding gas mine 37 (par. 100), and in sabotage work.

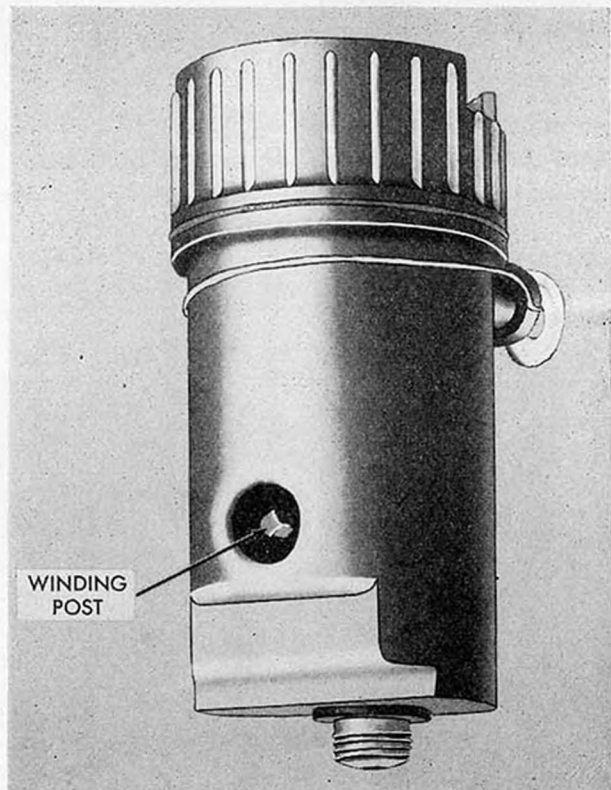
c. *Functioning.* The spring-loaded striker is attached to the clockwork mechanism by a hinged arm which also holds the striker in a cocked position. As the clockwork unwinds, the hinged arm is pushed aside by a slowly revolving cam. At the end of the set delay, the striker is released, firing the detonator.

d. *Installing and Arming.*

- (1) Wind the clockwork with the winding key and set the dial at the desired delay in minutes.
- (2) Insert the fuze into the charge.
- (3) Remove the safety-pin-retaining wire and pull the safety pin out of the fuze. This starts the clockwork mechanism. In type III set the arming knob at *scharf*.

e. *Neutralizing.*

- (1) For types I and II, insert a wire or nail into the safety-pin hole. For type



III, turn the arming dial to *sicher* and then insert a safety pin.

- (2) Remove the fuze from the charge.

## 57. 21-Day Clockwork Delay Fuze, J. Feder 504 (Uhrwerkz nder, J. Feder 504)

a. *Description.* The 21-day clockwork delay fuze J. Feder 504 (fig. 59) is a mechanical type. The fuze is  $3\frac{3}{8}$  inches in diameter and  $7\frac{5}{8}$  inches high. It has an aluminum case containing a spring-loaded striker actuated by a clockwork mechanism through a trip lever. There are two dials for setting the delay period. The dial marked in red (*rot*) is for the number of days (*tage*). It can be set for any number of days up to 21. The dial marked in black (*schwarz*) is for hours (*stunden*). It is graduated in  $\frac{1}{4}$ -hour increments up to 24 hours. Two screws are provided for a hole in the side of the base of the fuze. The screw marked *blind* merely closes the hole, allowing the safety spring to push the safety block under the shoulder of the striker shaft. This is a positive safety. The screw marked *scharf* (armed) is



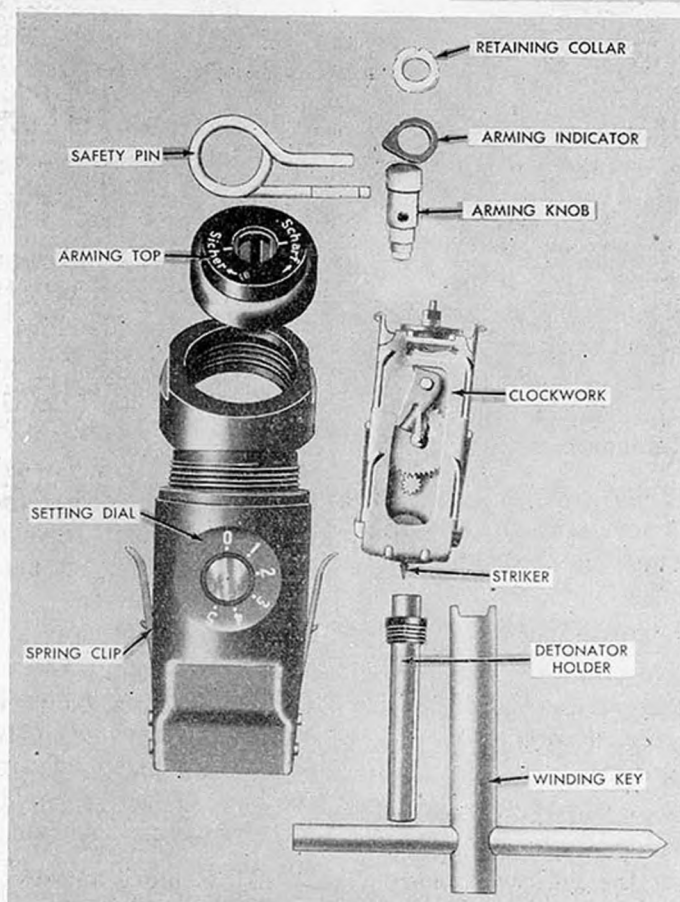
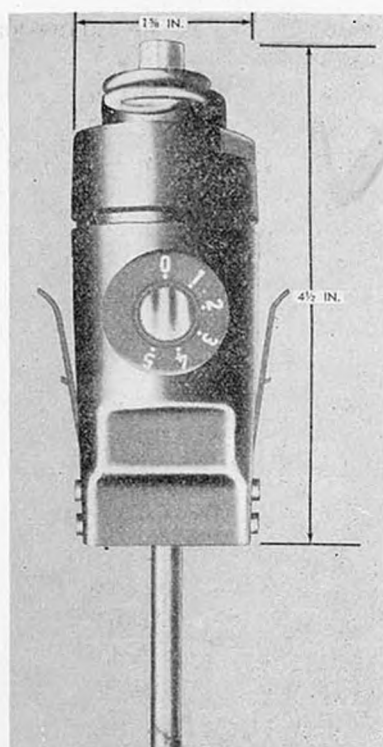
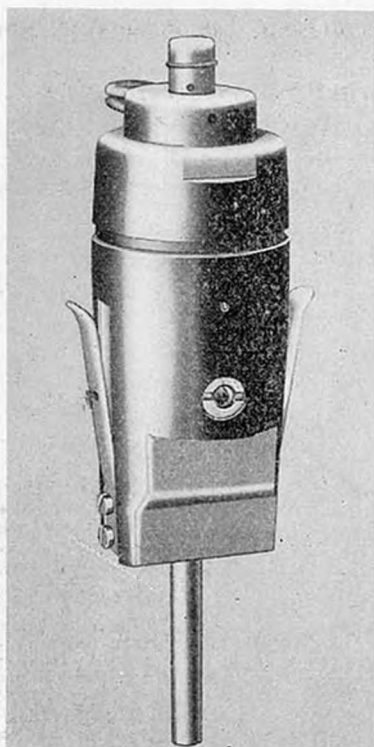


Figure 58. 5-minute clockwork delay fuze, type III.

the arming screw. It pushes the spring-loaded safety block away from the striker shaft just far enough so the shoulder of the striker shaft will go through the hole in the safety block. A modified model of the J. Feder 504 is fitted with an electrical-control base consisting of two wire leads connected to an electric detonator placed in a charge. The modified version also has two terminals in the top of the fuze for wiring into an electrical circuit.

percussion cap, the detonator, and the main charge.

*d. Installing and Arming.*

- (1) Test the fuze by setting it for 15 minutes to see that it is functioning correctly. Re-cock the fuze with the re-cocking device.
- (2) Unscrew the cover and wind the clock by turning the knurled winding knob clockwise.

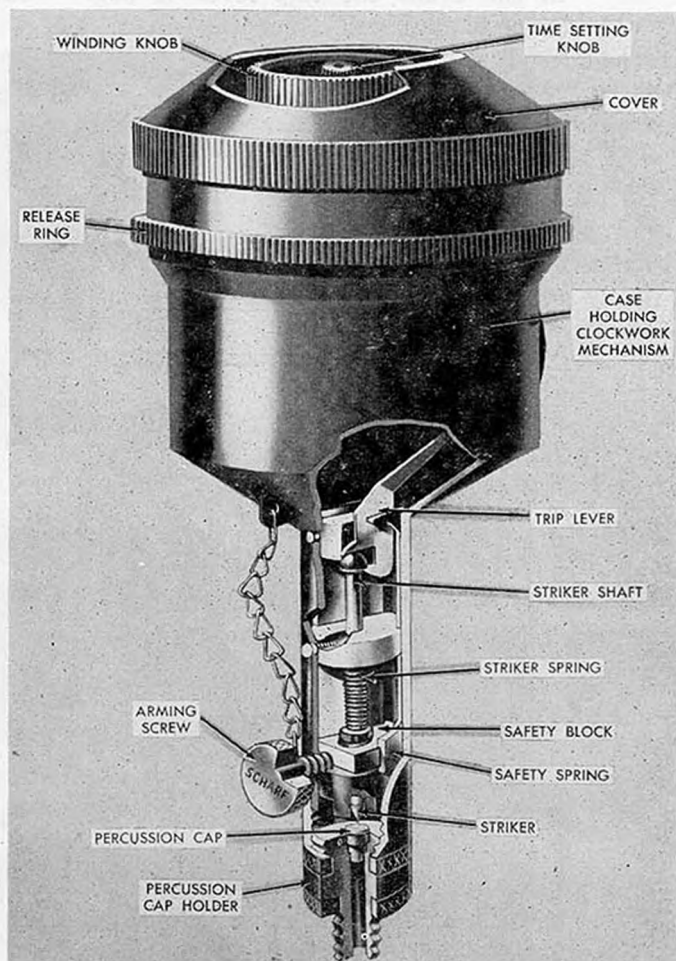
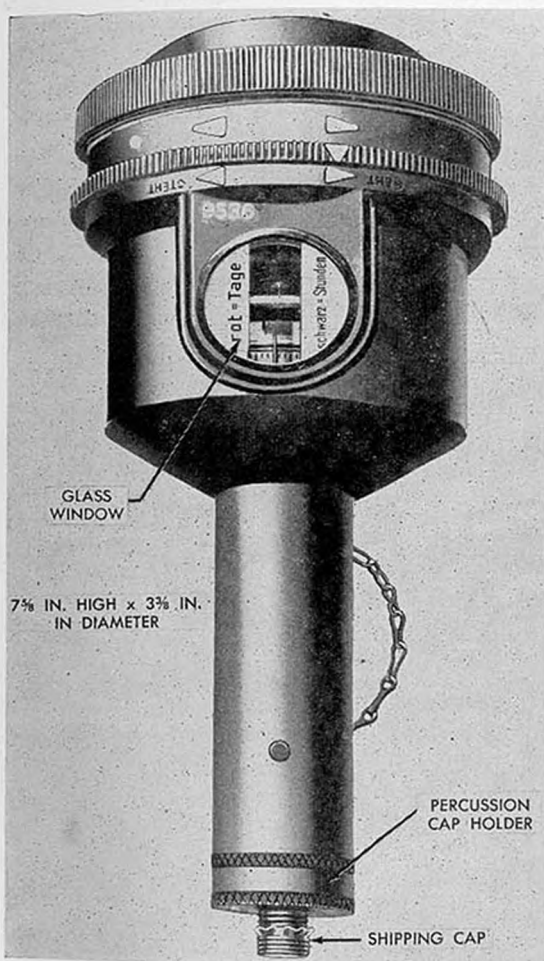


Figure 59. 21-day clockwork delay fuze, J. Feder 504.

*b. Employment.* This device is used for the delayed detonation of large charges in areas abandoned to an opposing force.

*c. Functioning.* At the end of the delay period, determined by the setting, a lever arm on the rotating control disk on the clockwork bears against the trip lever, disengaging the head of the striker shaft. The released striker fires the

- (3) Turn the knurled time-setting knob in the top of the fuze to the desired delay.
- (4) Attach the detonator to the percussion-cap holder, and insert the fuze in the charge.
- (5) Remove the screw marked *blind* in the base of the fuze, and screw in the arming screw marked *scharf* (armed).

- (6) Turn the release ring above the setting indicator window so the red mark is opposite *geht* (go).

*e. Neutralizing.*

- (1) Remove the arming screw marked *scharf*, which allows the spring-loaded safety block to move under the shoulder of the striker shaft. This keeps the striker from descending far enough to strike the percussion cap, in the event the trip lever is acci-

dentally disengaged from the head of the striker shaft.

- (2) Turn the red mark on the release ring from *geht* (go) to *steht* (stop).  
(3) Remove the fuze and the detonator from the charge.

*f. Packing.* This fuze is packed in a black wooden box stenciled *J. Feder 504*. The percussion-cap holder and the re-cocking device are carried in the welled blocks (fig. 60).

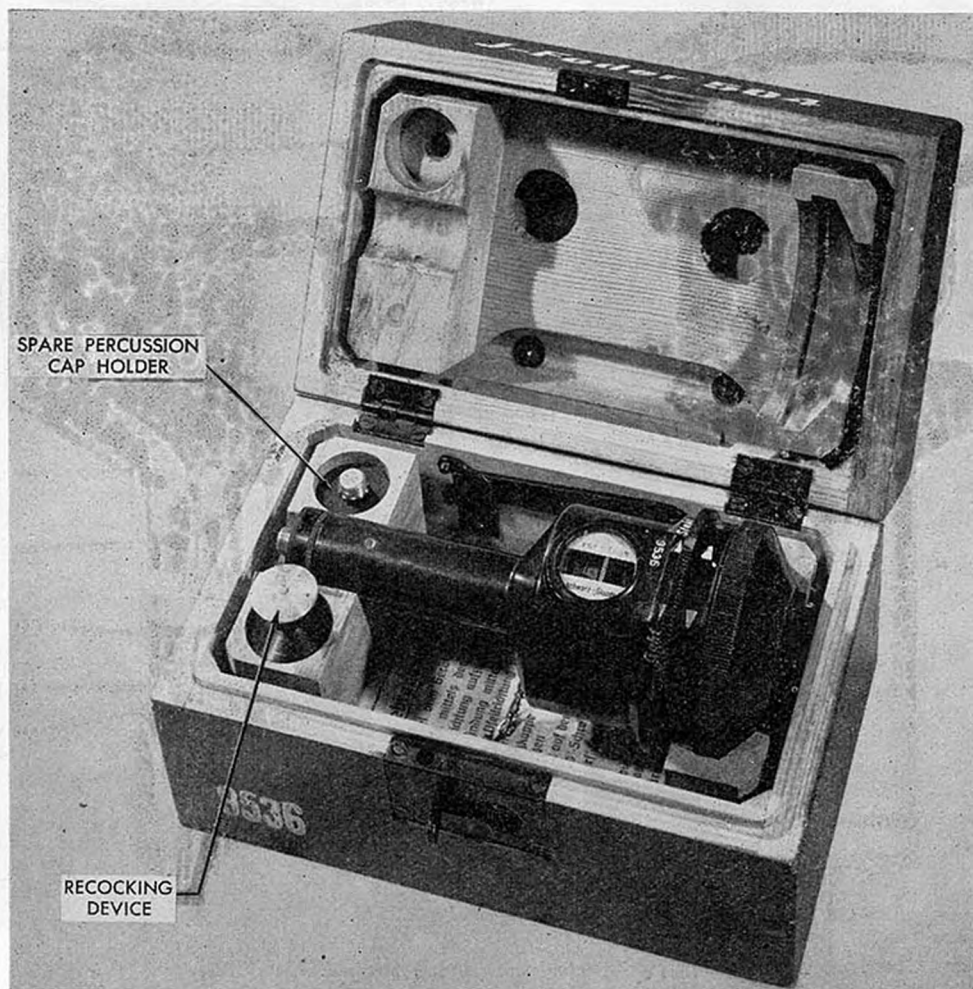


Figure 60. 21-day clockwork delay fuze, J. Feder 504, packed in the standard carrying case.

## Section IX. INDUCTION FUZES

### 58. General

As early as December 1943, the Russians had developed a frequency-induction fuze designed to detonate mines or charges when an electronic

mine detector was swept over the fuze. In January, 1944, the Germans experimented with a number of captured Soviet frequency-induction fuzes and found that 86 percent of them were



unreliable. The Germans perfected this type of fuze in early 1944 and produced the SM-12 fuze which was much superior to the Russian model. A modified and simplified model was produced by the Germans at the end of World War II. None of these fuzes were known to have been actually employed in combat.

## 59. Frequency-Induction Fuze SM-12 (Frequenzinduktionzünder SM-12 F.I.Z. SM-12)

*a. Description.* The frequency-induction fuze SM-12 (fig. 61) is an instantaneous, electrical fuze in which frequency induction closes an electrical circuit. Two models were made. The earlier model is housed in a black, cylindrical, laminated-wood case and the later model is housed in a black, cylindrical, bakelite case. Both models measure  $6\frac{3}{4}$  inches in diameter and  $3\frac{3}{4}$  inches in height. They weigh about 2.5 pounds. The contents of the two models are—

Item	Wood case	Bakelite case
Sensitive relay	3	1
Dry-disk rectifier	1	1
Pick-up coil	1	1
Condenser	2	2
Resistor	2	2
Leaf type arming-delay switch	2	1
Electrolytic-delay arming switch	0	1
1.5-volt dry-cell battery	2	2

The internal elements of the fuze are mounted on sponge-rubber pads and are bolted to the case. A tube for the detonator cable passes through the fuze and out at both the top and the bottom of the fuze. It is closed by a cork on the top and by a shipping cap on the bottom. An arming nut or screw is located on the top of the case, with a white arrow to indicate the direction to turn it for arming the fuze. A cable connects the fuze to an electric detonator (fig. 62).

*b. Employment.* This fuze is designed to explode a mine or charge to which it is connected, by picking up the signal emitted by an electronic mine detector sweeping mine fields and roads.

*c. Functioning.* When the search coil of a frequency-bridge type mine detector, operating in the frequency range of between 800 and 2000 cycles, is passed over an armed fuze within a maximum distance of 17 inches, its signal is picked up by the pickup coil in the fuze. This closes the secondary or safety arming switch, completing the circuit and firing the electric detonator. The details of the internal functioning of both models are as follows:

- (1) *Wood-cased model.* See the wiring diagram (fig. 63). The circuit is made up of three stages: the arming circuit, the

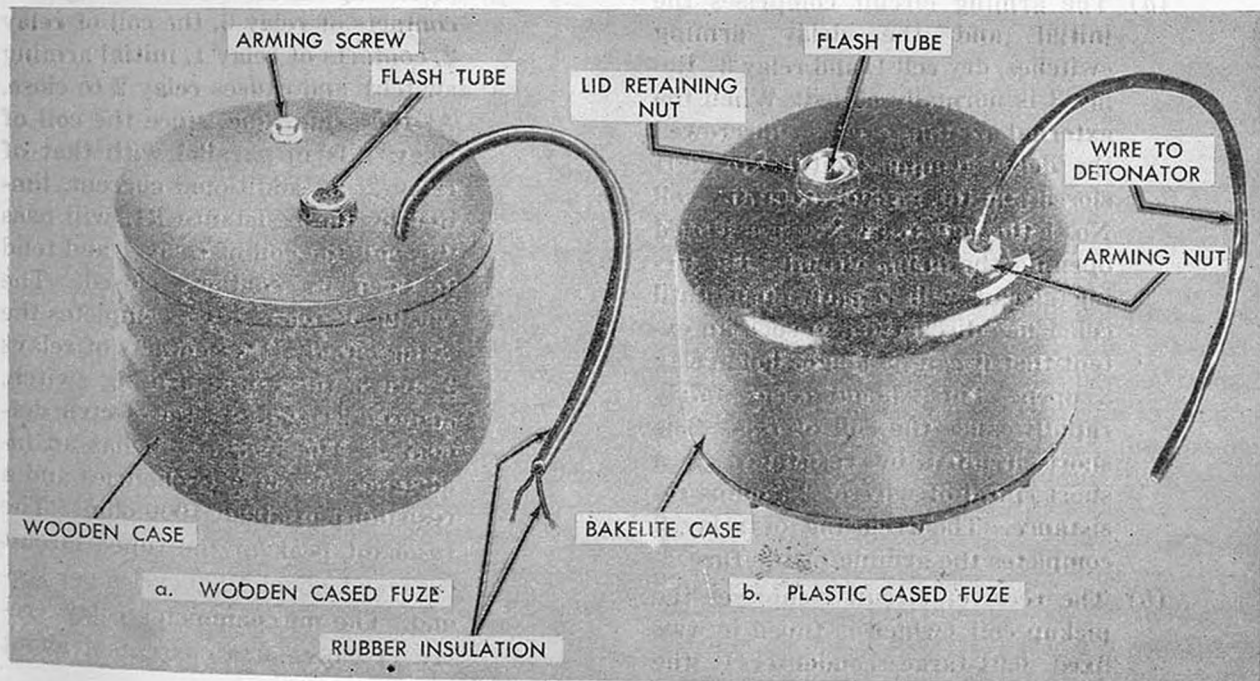


Figure 61. Frequency-induction fuze SM-12.

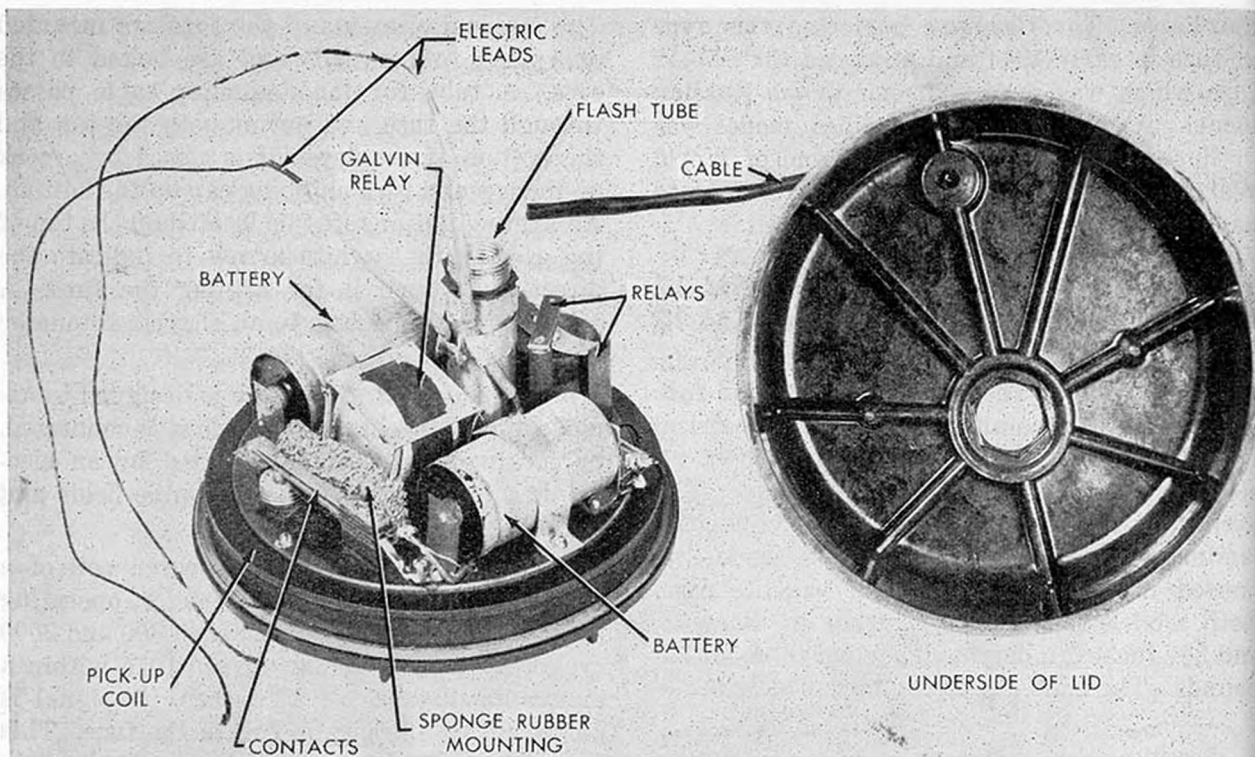


Figure 62. Internal view of frequency-induction fuze, plastic model.

pickup or receiver circuit, and the firing circuit. However, certain components are included in more than one of these circuits.

- (a) The arming circuit comprises the initial and the delay arming switches, dry cell 1, and relay 3. Relay 3 is normally closed. When the external arming screw is unscrewed the delay arming switch No. 2 is closed and the circuit from dry cell No. 1 through relay No. 3 is closed opening the firing circuit. The firing circuit will remain open until cell 1 has discharged to such an extent that it can no longer hold relay 3 open. This should occur fairly rapidly since the coil of relay 3 is short-circuited by resistance 2, a short spiral of wire of 2.5 ohms resistance. The reclosing of relay 3 completes the arming of the fuze.
- (b) The receiver circuit comprises the pickup coil (which is tuned by two fixed 0.01-farad condensers), the dry-disk rectifier, and the coil of

re'ay 1 (the microammeter relay). A signal picked up by the coil is rectified. If sufficiently strong, it causes relay 1 to close. This completes the circuit (cell 2 through the contacts of relay 3, the coil of relay 2, contacts of relay 1, initial arming switch) and causes relay 2 to close. At the same time, since the coil of relay 1 is in parallel with that of relay 2, an additional current, limited by the resistance R1, will pass through the coil of relay 1 and tend to keep its contacts closed. The closing of relay 2 also completes the firing circuit (the contacts of relays 2 and 3, the initial arming switch and cell 2) and fires the electric detonator. The pickup coil has an inductance of 750 microhenries and a resistance of about 1000 ohms. The resonant peak of the tuned circuit occurs at about 1050 cycles per second. The microammeter relay (re'ay 1) closes at a current of about 10 microamperes.

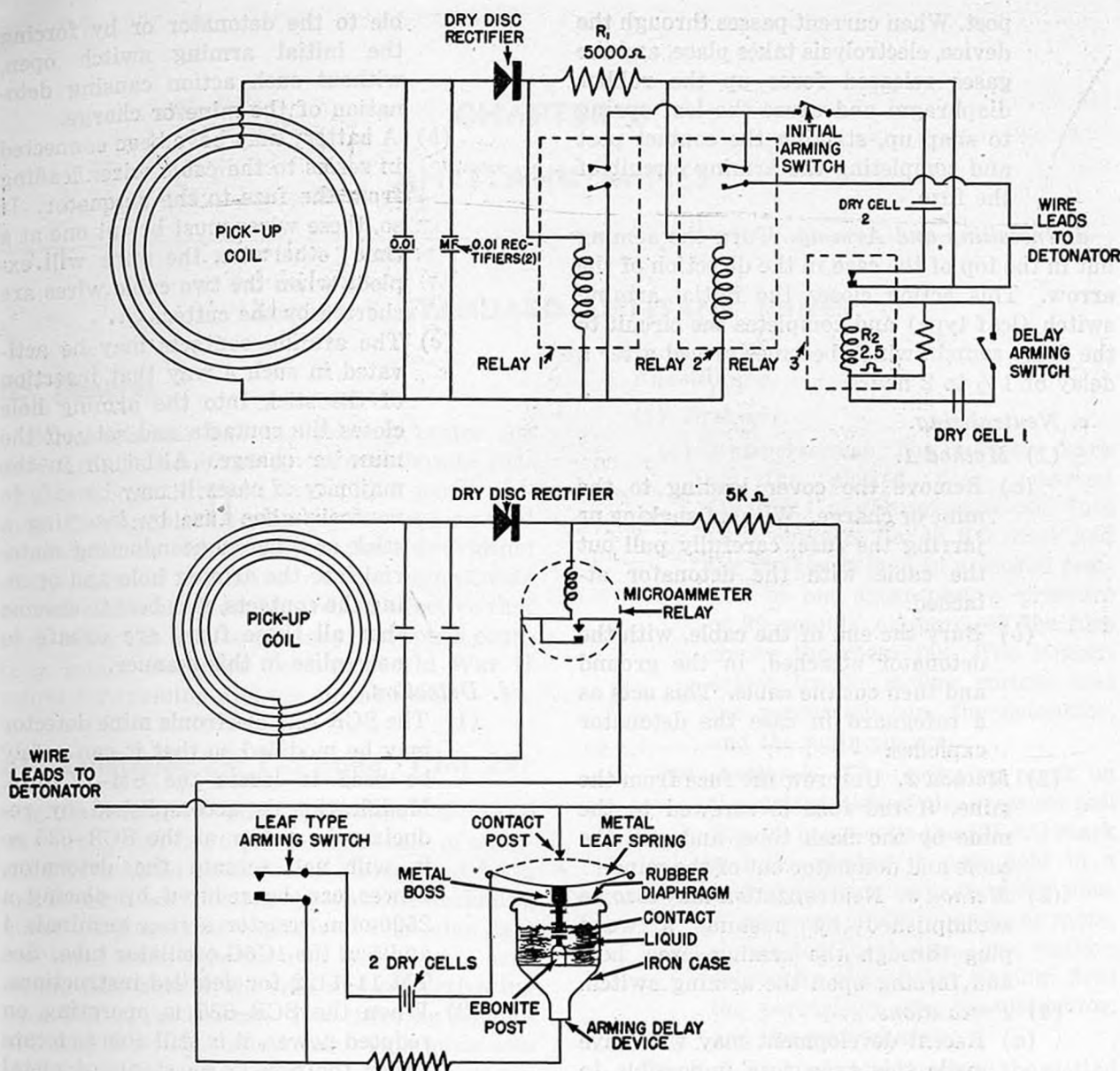


Figure 63. Wiring diagram of the two models of the SM-12 frequency-induction fuze.

- (2) *Plastic-cased model.* The internal components and layout of this later model are generally similar to those of the earlier model, with the exception that the leaf type arming-delay switch has been replaced by an electrolytic-delay switch which eliminates the firing relay. The circuit is much simpler than that of the earlier model. The arming-delay device holds the firing circuit open, after the arming nut has been unscrewed, for about 2 hours. The device consists of a small iron case

partially filled with liquid, with a rubber diaphragm over the otherwise open end of the container. A central metal boss protrudes from the top of the diaphragm and continues underneath as a screw, ending in a sharp point which rests in a recess in the top of an ebonite post attached to the base of the case. Above the case and contacting the boss (when in the unarmed position) is a metal leaf spring supported between two copper strips. Above this leaf spring is a contact



post. When current passes through the device, electrolysis takes place, and the gases released force up the rubber diaphragm and cause the leaf spring to snap up, striking the contact post and completing the arming circuit of the fuze.

*d. Installing and Arming.* Turn the arming nut in the top of the case in the direction of the arrow. This action closes the initial arming switch (leaf type) and completes the circuit to the delay switch, which becomes armed after a delay of 1½ to 2 hours.

*e. Neutralizing.*

*(1) Method 1.*

(a) Remove the cover leading to the mine or charge. Without shaking or jarring the fuze, carefully pull out the cable with the detonator attached.

(b) Bury the end of the cable, with the detonator attached, in the ground and then cut the cable. This acts as a safeguard in case the detonator explodes.

(2) *Method 2.* Unscrew the fuze from the mine, if the fuze is screwed to the mine by the flash tube, and pull the cable and detonator out of the mine.

(3) *Method 3.* Neutralization may also be accomplished by pushing a wood plug through the arming-screw hole and forcing open the arming switch.

*(4) Precautions.*

(a) Recent development may well have made this type fuze impossible to neutralize either by cutting the ca-

ble to the detonator or by forcing the initial arming switch open, without such action causing detonation of the mine or charge.

(b) A battery may have been connected in series to the cable wires leading from the fuze to the detonator. If so, these wires must be cut one at a time; otherwise, the mine will explode when the two cable wires are shorted by the cutter.

(c) The arming contacts may be activated in such a way that insertion of the stick into the arming hole closes the contacts and sets off the mine or charge. Although in the majority of cases it may be safe to neutralize the fuze by inserting a stick or other nonconducting material into the arming hole and opening the contacts, it is best to assume that all these fuzes are unsafe to neutralize in this manner.

*f. Detection.*

- (1) The SCR-625 electronic mine detector may be modified so that it can safely be used to locate the SM-12 fuze. Modification is accomplished by reducing the power of the SCR-625 so it will not actuate the detonator. Power can be reduced by placing a 2500-ohm resistor across terminals 4 and 5 of the 1G6G oscillator tube. See TM 11-1122 for detailed instructions.
- (2) When the SCR-625 is operating on reduced power, it is still able to locate either the SM-12 or standard metal mines from a distance of 2 to 3 feet.

## CHAPTER 6

### ANTITANK MINES

#### Section I. STANDARD ANTITANK MINES

##### 60. General

German mines and the packing crates for them are characterized by their elaborate construction and intricately machined parts. Almost all standard German mines were marked somewhere on the case with the abbreviation of the name of the mine. German mines were so well constructed and proved so effective that even today the armies of many European countries retain stocks of German World War II mines for training and use in the field.

##### 61. Tellermine 29; T-5 Mine (T.Mi. 29)

*a. Description.* The Tellermine 29 (T-5 mine) (fig. 64) has a plate-shaped case of sheet-zinc. It is about 10 inches in diameter and  $2\frac{3}{4}$  inches high and weighs 13 pounds, including about 10 pounds of explosive. The mine case has three main fuze wells in the top, two activating fuze wells in the side, and one activating fuze well in the bottom. Two carrying handles are attached to the mine case. This mine uses the pressure-pull fuze 29 (par. 36), which can be set to detonate by either pressure or pull, in the main fuze wells. Any pull fuze with standard threads can be used in the activating fuze wells. Although the Tellermine 29 was designed for antitank use, it is actually a dual-purpose mine since the pressure-pull fuze 29 can be actuated by personnel when the indicator mark on the slotted disk is opposite the 45 KG mark or ZUG.

*b. Employment.* The Tellermine 29 was used in road blocks and mine fields until it was replaced by the Tellermine 35 (par. 62). It was used primarily against tanks and occasionally against personnel.

##### *c. Functioning.*

###### (1) *Pressure.*

(a) *Antipersonnel.* The indicator mark on the slotted disk (marked DRUCK) of the pressure-pull fuze 29 is opposite the 45 KG mark and the striker is held in a cocked position by one shear pin. A pressure of 99 pounds, or more, on the fuze shears the shear pin. The striker, driven by the striker spring, fires the percussion cap, the detonator, and the main charge.

(b) *Antitank.* The indicator mark on the slotted disk of the pressure-pull fuze 29 is opposite the 125 KG mark and the striker is now held in a cocked position by both shear pins. A pressure of 276 pounds, or more, shears the shear pins. The striker, driven by the striker spring, fires the percussion cap, the detonator, and the main charge.

(2) *Pull.* The indicator mark on the slotted disk of the pressure-pull fuze 29 is opposite ZUG and the striker is held in a cocked position only by the pull pin. A pull of 10 pounds pulls out the pull pin. The striker, driven by the striker spring, fires the percussion cap, the detonator, and the main charge.

##### *d. Installing and Arming.*

- (1) Place the mine in a hole in the ground, with its top flush with the top of the ground.
- (2) Remove the shipping caps from three pressure-pull fuzes 29 and insert a detonator in the base of each fuze.

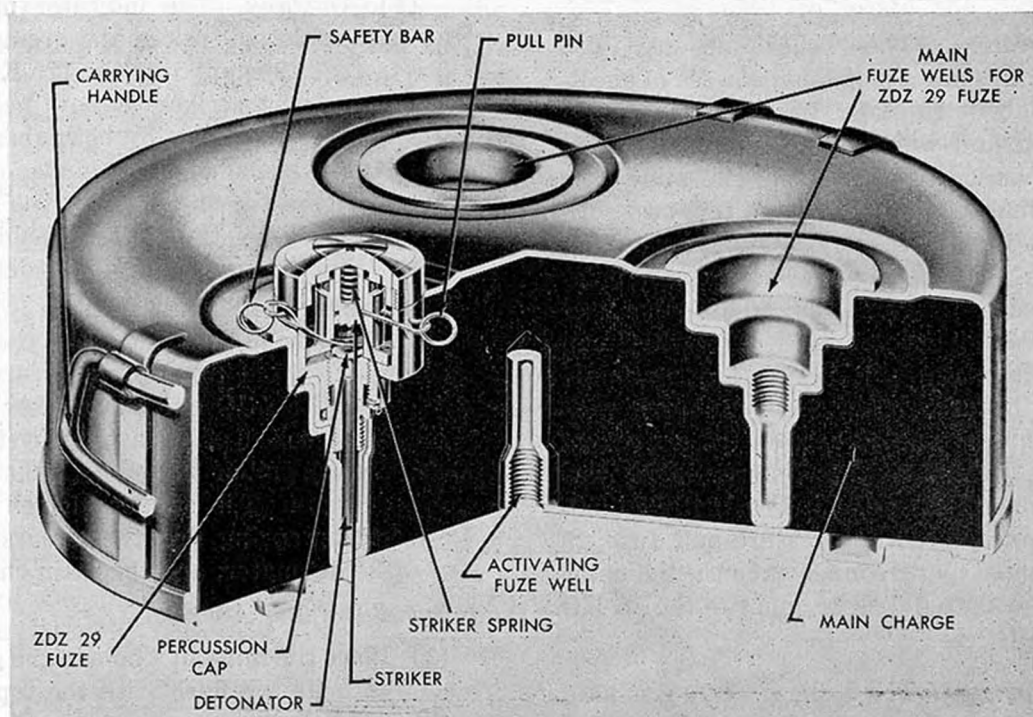
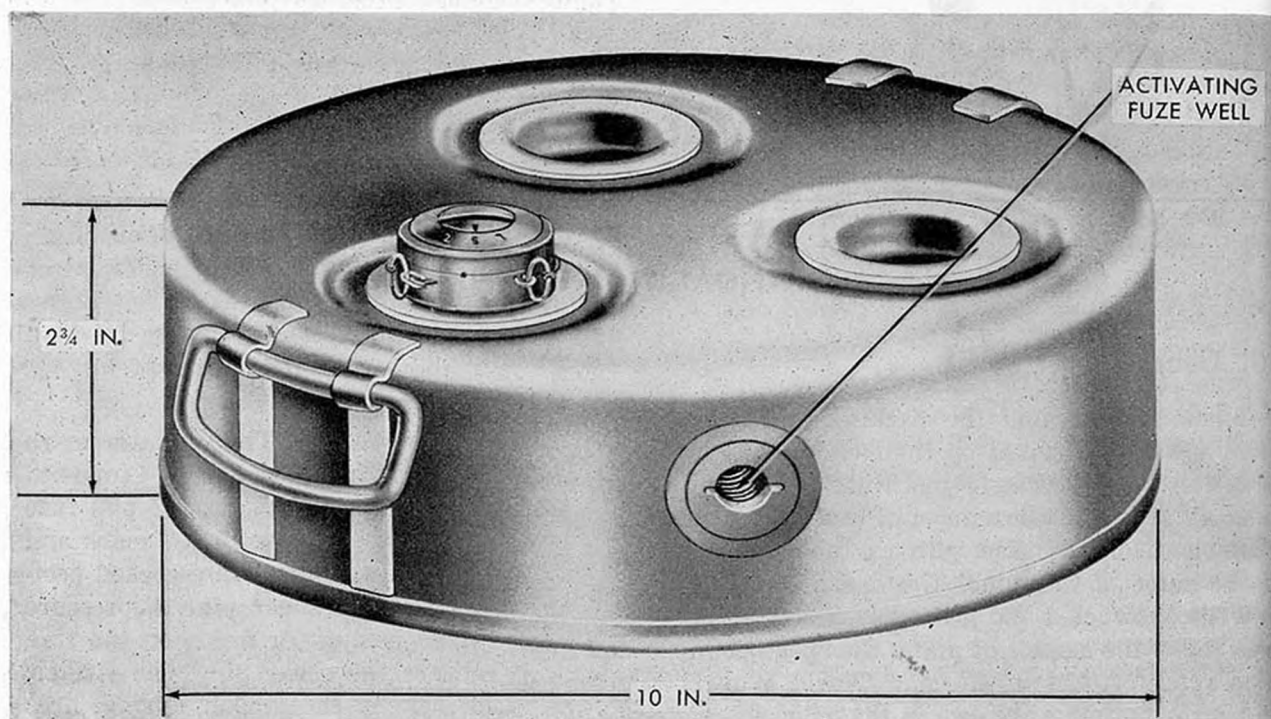


Figure 64. Tellermine 29 (T-5 mine).



- (3) Turn the slotted disks of the pressure-pull fuzes 29 to the desired setting (c above).
- (4) Screw a pressure-pull fuze 29 into each of the three main fuze wells in the top of the mine.
- (5) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming for the activating fuze.
- (6) Attach wires or cords to the rings on the safety bars of the pressure-pull fuzes 29 and remove the bars from a safe distance.

*Note.* If the indicator mark of any of the pressure-pull fuzes 29 is set at ZUG and the pull pin is withdrawn by accident before the safety bar is removed, the striker engages in a slot in the safety bar and prevents removal of the bar.

*e. Neutralizing.* Do not lift the mine until the side and bottom activating fuze wells have been examined for activating fuzes. If any are present, neutralize them according to the instructions in chapter 5. To neutralize each of the three pressure-pull fuzes 29 in the three main fuze wells in the top of the mine, proceed as follows:

- (1) If the original safety bar is available, insert it in the slot marked SICH. Do not try to insert an improvised safety bar such as a nail or penknife into the slot marked SICH because an edge may come into contact with the percussion cap and cause it to explode.
- (2) Cut any slack trip wires attached to the pull pin.
- (3) Grasp the fuze around its base without touching the top and gently unscrew the fuze from the mine.
- (4) Remove the detonator from the fuze.
- (5) Unscrew the percussion-cap-holder set screw and unscrew the percussion-cap holder from the base of the fuze.

## 62. Tellermine 35 (T.Mi. 35)

*a. Description.* The antitank Tellermine 35 (fig. 65) is 12½ inches in diameter and 3¼ inches high. It weighs 19 pounds including 11

pounds of explosive. The mine consists of a circular, flat-bottomed, sheet-steel case with a slightly convex pressure plate. The centrally located main fuze well is provided with a pressure-plate spring between the pressure plate and the container for the main charge. The mine has two activating fuze wells, one in the side and one in the bottom, and a carrying handle on the side of the mine. The Tellermine fuze 35 (par. 15) is used in the main fuze well, and any standard pull fuze may be used in the activating fuze wells.

*b. Employment.* This mine is used in road blocks and defense systems. It also may be enclosed in a waterproof jacket and used with antiboat obstacles along beaches.

### *c. Functioning.*

- (1) A pressure of about 400 pounds on the center or 200 pounds on the edge of the pressure plate depresses the pressure plate, the pressure plate spring, and the fuze case.
- (2) The fuze case presses on the top of the striker shaft, shearing the shear pin which holds the striker in a cocked position.
- (3) The striker, driven by the striker spring, sets off the percussion cap, the detonator, the booster charge, and the main charge.

### *d. Installing and Arming.*

- (1) Place the mine in a hole with the carrying handle in the horizontal or down position.
- (2) Unscrew the wooden shipping plug from the main fuze well and insert a detonator in the fuze well.
- (3) Screw in the threaded washer to hold the detonator in place and then screw in the adjusting collar. A special wrench is provided in the fuze packing box for screwing in the threaded washer and the adjusting collar.
- (4) Place the rubber or leather washer in the groove of the adjusting collar.
- (5) Screw the Tellermine fuze 35 into the main fuze well until it bears on the rubber or leather washer.
- (6) If activating is desired, screw any pull fuze with standard threads into an ac-

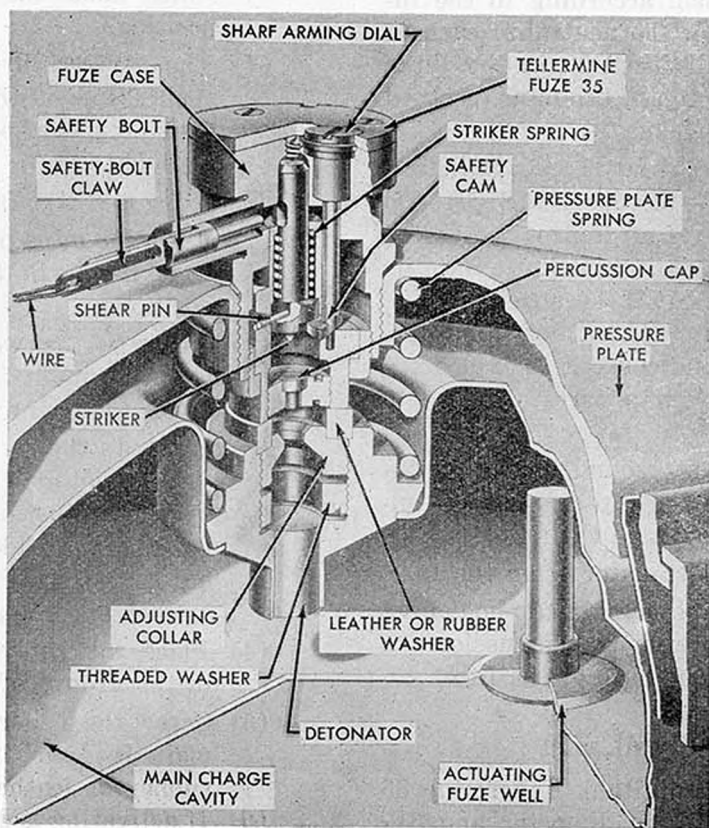
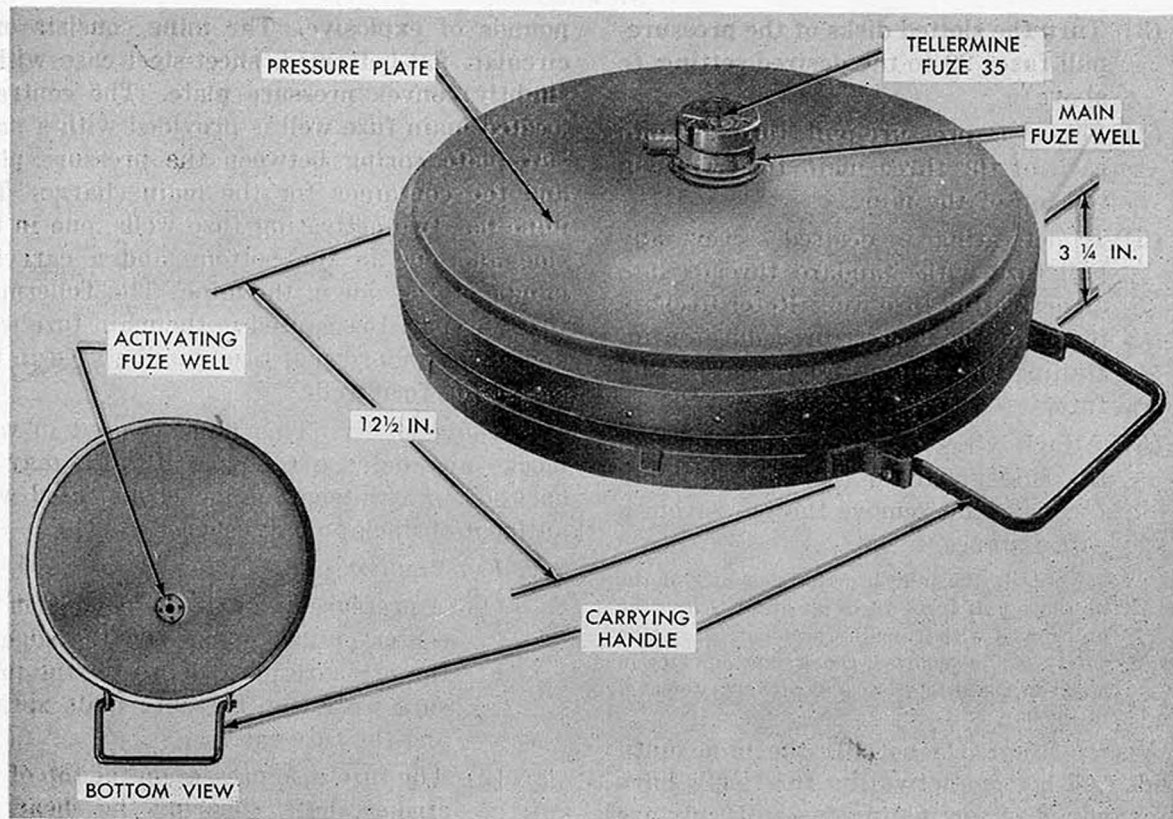


Figure 65. Tellermine 35.

tivating fuze well. Refer to chapter 5 for the correct procedure on installing and arming of the activating fuzes.

- (7) Turn the screw head arming dial in the top of the Tellermine fuze 35 so the red dot points to *scharf* (armed).
- (8) Pull the safety bolt out by the wire attached to the safety-bolt claw.

*e. Neutralizing.* Inspect the Tellermine fuze 35 carefully for any damage which might have partially sheared the shear pin.

- (1) *Damaged fuze.* Do not attempt to neutralize the fuze. Destroy the mine in place with explosive or pull the mine loose from a prone position with a 50-yard rope or wire, drag it to a safe place, and destroy it.
- (2) *Undamaged fuze.*

- (a) Press in the safety bolt.

**Caution:** If the safety bolt does not press in easily, *do not force*. Treat as a damaged fuze as in (1) above.

- (b) Neutralize the activating fuzes, if any, and lift the mine.

- (c) Remove the Tellermine fuze 35 and then turn the arming dial from *scharf* to *sicher* (safe). Tape or wire the safety bolt in place, and replace the fuze in the mine.

*f. Packing.* These mines are shipped in two different types of metal cases (fig. 66). One case holds two mines and weighs 51 pounds loaded. The other case holds one mine and weighs 28 pounds loaded.

### 63. Tellermine 35 (Steel) (T.Mi. 35(S))

*a. Description.* The Tellermine 35 (steel) (fig. 67) is 12½ inches in diameter and 3½ inches high. It weighs 19 pounds, including 11 pounds of explosive. It differs from the Tellermine 35 in that it has a fluted pressure plate to keep the sand covering from blowing off in desert areas; booster charges surround the fuze wells; and a threaded pressure plug conceals the main fuze, if it is a Tellermine fuze 42 (par. 16) or 43 (par. 33). This pressure plug is not used if the mine is fitted with the Tellermine fuze 35 (par. 15).

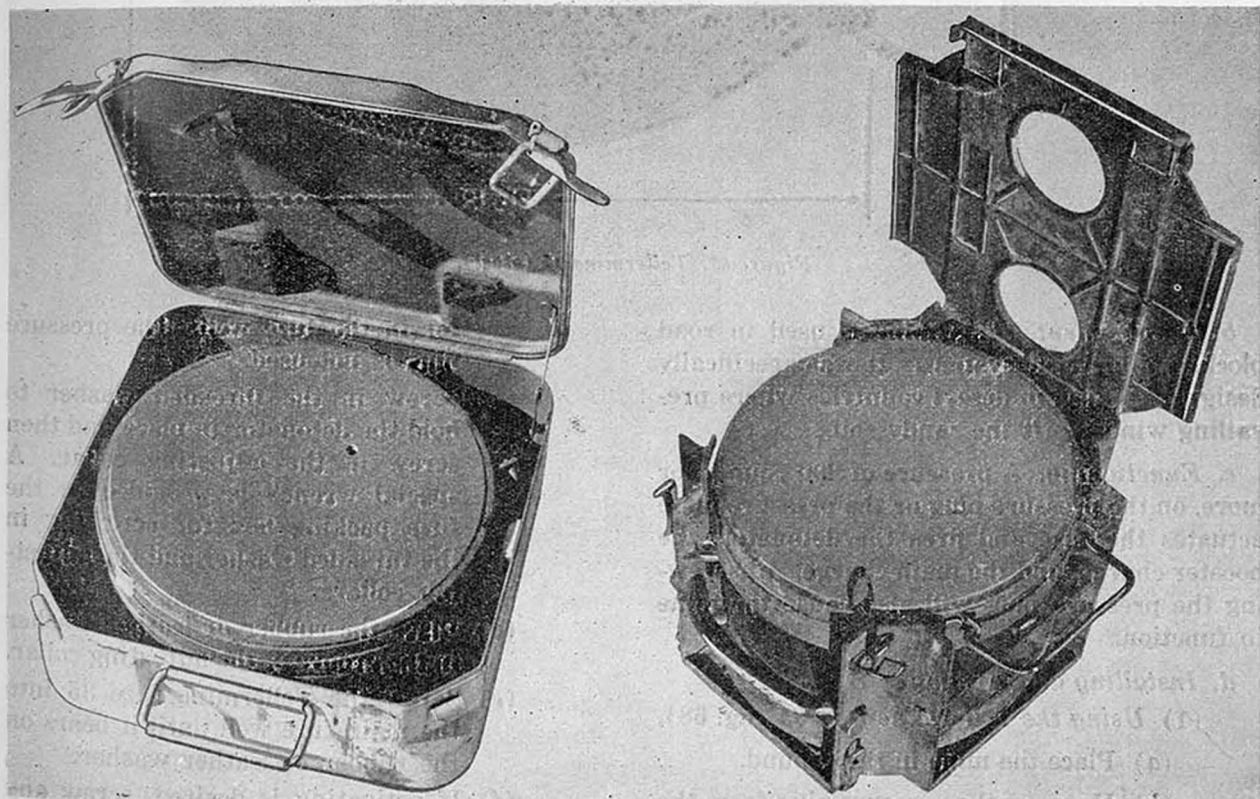


Figure 66. Packing cases for the Tellermine 35.



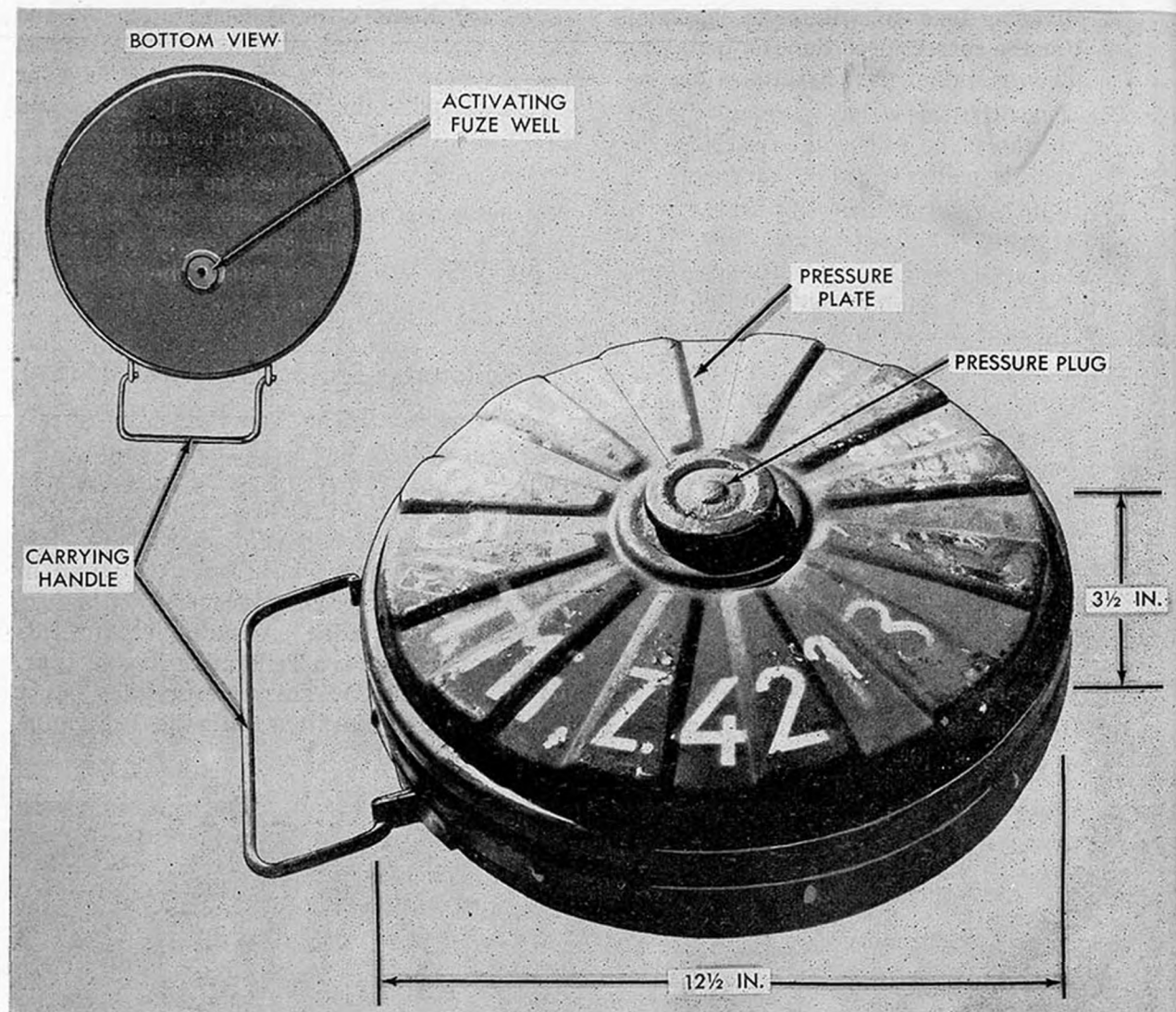


Figure 67. Tellermine 35 (steel).

*b. Employment.* This mine is used in road blocks and defense systems. It was specifically designed for use in desert countries where prevailing winds shift the sandy soil.

*c. Functioning.* A pressure of 200 pounds, or more, on the pressure plug or the pressure plate actuates the fuze and fires the detonator, the booster charge, and the main charge. Unscrewing the pressure plug will also cause the mine to function.

*d. Installing and Arming.*

(1) *Using the Tellermine fuze 35 (fig. 68).*

- (a) Place the mine in the ground.
- (b) Unscrew the pressure plug from the main fuze well and insert a detona-

tor in the fuze well. The pressure plug is not used.

- (c) Screw in the threaded washer to hold the detonator in place and then screw in the adjusting collar. A special wrench is provided in the fuze packing box for screwing in the threaded washer and the adjusting collar.
- (d) Place the rubber or leather washer in the groove of the adjusting collar.
- (e) Screw the Tellermine fuze 35 into the main fuze well until it bears on the rubber or leather washer.
- (f) If activating is desired, screw any pull fuze with standard threads into

an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming of the activating fuze.

- (g) Turn the screw head arming dial in the top of the Tellermine fuze 35 so the red dot points to *scharf* (armed).
- (h) Pull the safety bolt out by the wire attached to the safety-bolt claw.

(e) Screw on the pressure plug.

(f) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming of the activating fuze.

(3) *Using the Tellermine fuze 43.*

(a) Place the mine in the ground.

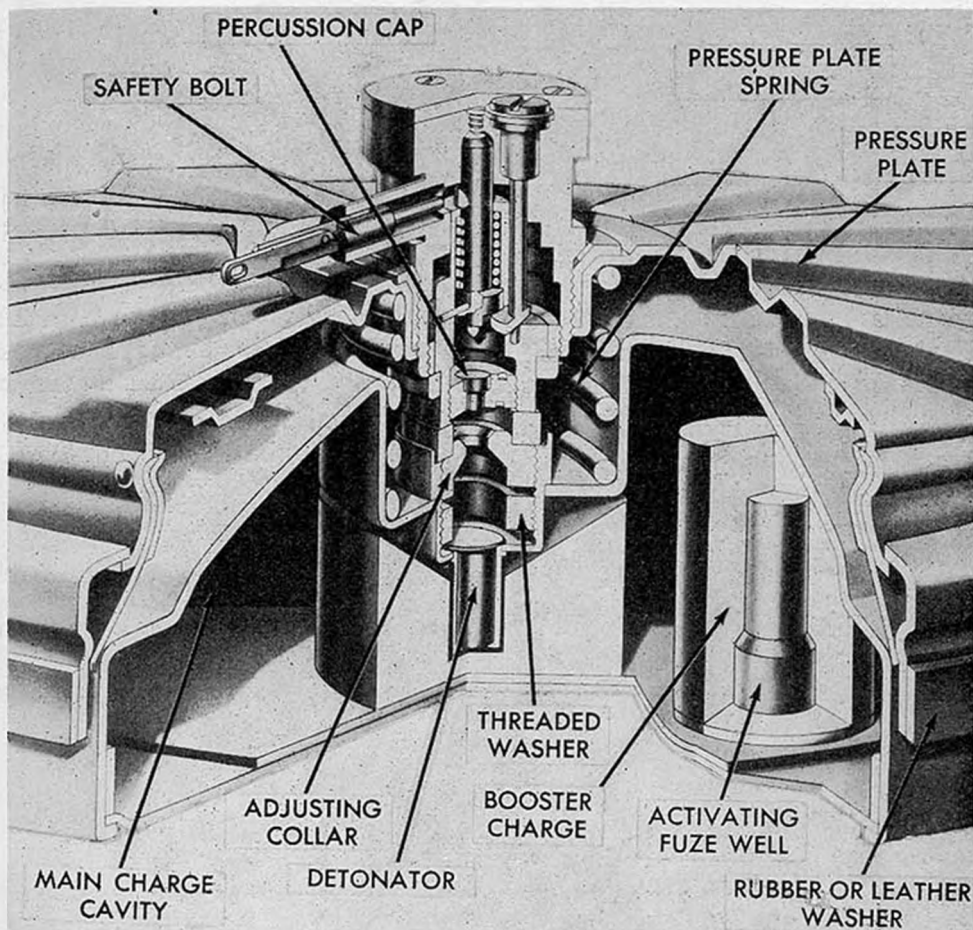


Figure 68. Tellermine 35 (steel) with Tellermine fuze 35.

(2) *Using the Tellermine fuze 42 (fig. 69).*

- (a) Place the mine in the ground.
- (b) Unscrew the pressure plug from the main fuze well and screw a fuze adapter into the fuze well.
- (c) Screw a detonator-retaining collar, with the detonator, to the base of a Tellermine fuze 42.
- (d) Insert the Tellermine fuze 42, with detonator, into the fuze adapter.

(b) Unscrew the pressure plug from the main fuze well and screw a fuze adapter into the fuze well.

(c) Screw a detonator-retaining collar, with the detonator, to the base of a Tellermine fuze 43.

(d) Insert the Tellermine fuze 43, with detonator, into the fuze adapter.

(e) Screw the pressure plug down until a click is heard. This indicates that

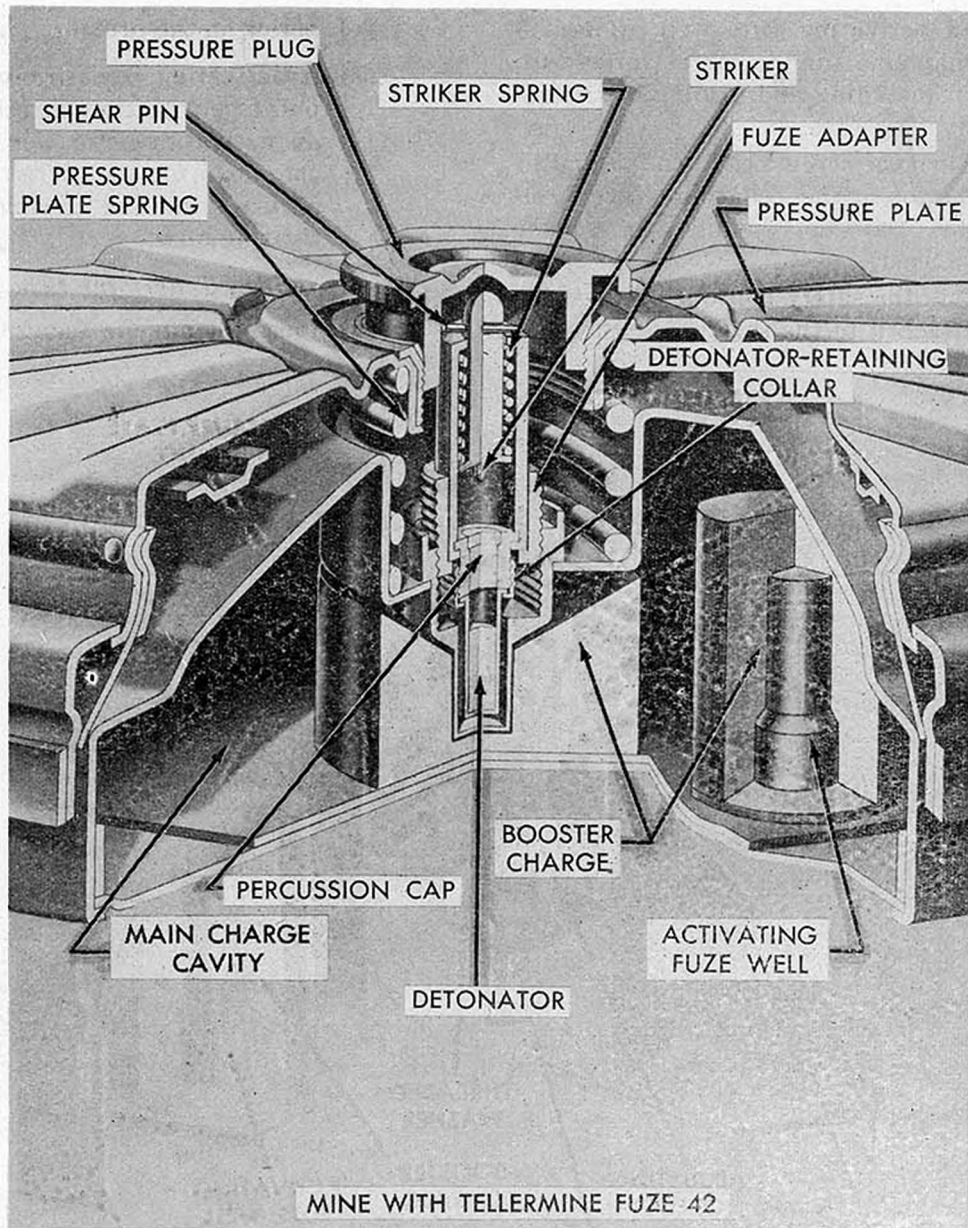


Figure 69. Tellermine 35 (steel) with Tellermine fuze 42.

the arming shear pins have sheared and that the fuze is now armed.

- (f) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming of the activating fuze.

*e. Neutralizing.*

- (1) *Tellermine fuze 35.* This mine is safe to neutralize *only* when fitted with the Tellermine fuze 35. This fuze is vis-

ible when screwed into the mine. Inspect the fuze carefully for any damage which might have partially sheared the shear pin.

- (a) *Damaged fuze.* Do not attempt to neutralize the fuze. Destroy the mine in place with explosive or pull the mine loose from a prone position with a 50-yard rope or wire, drag it to a safe place, and destroy it.

- (b) *Undamaged fuze.*

1 Press in the safety bolt.



**Caution:** If the safety bolt does not press in easily, *do not force*. Treat as a damaged fuze as in (a) above.

- 2 Neutralize the activating fuzes, if any, and lift the mine.
- 3 Remove the Tellermine fuze 35 and then turn the arming dial from *scharf* to *sicher*. Tape or wire the safety bolt in place, and replace the fuze in the mine.

- (2) *Tellermine fuze 42 or 43.* When either the Tellermine fuze 42 or 43 is used, no attempt should ever be made to neutralize this mine. The pressure plug is present when either of these two fuzes is used. The mine should be destroyed in place or pulled loose with rope or wire and dragged to a safe place and then destroyed. When pulling the mine loose, lie prone at a distance of about 50 yards from the mine.

*f. Packing.* One mine is packed in an open wooden crate or two mines are packed on edge in a metal box with a hinged lid.

## 64. Tellermine 42 (T.Mi. 42)

*a. Description.* The Tellermine 42 (fig. 70) is  $12\frac{3}{4}$  inches in diameter and 4 inches high. It weighs 19 pounds, including 11 pounds of explosive. It has a circular, fluted pressure plate, 6 inches in diameter, instead of an overall pressure plate as in the Tellermines 35 (par. 62) and 35 (steel) (par. 63). A hexagonal, pressure plug in the center of the pressure plate covers the main fuze well. The Tellermine 42 has two activating fuze wells, one in the bottom and one in the side. A carrying handle is provided. This mine uses the Tellermine fuze 42 (par. 16) or 43 (par. 33) in the main fuze well.

*b. Employment.* This mine is used primarily in mine belts, mine fields, and other areas subject to artillery fire and other blast effect. The smaller pressure plate makes the mine less likely to be detonated from pressures caused

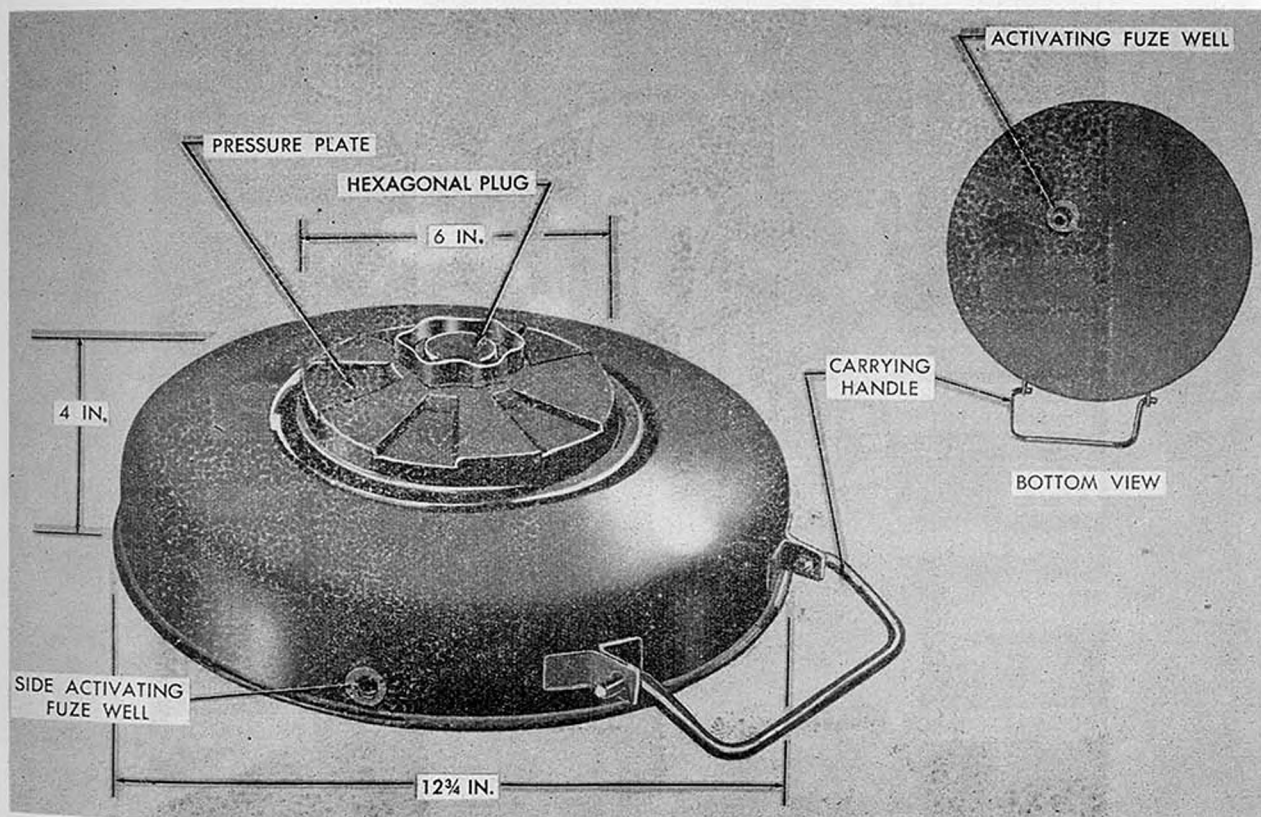


Figure 70. Tellermine 42.

by blast than the Tellermines 35 and 35 (steel). The Tellermine 42 is also used in road blocks and defense systems.

*c. Functioning.*

(1) If the Tellermine fuze 43 (fig. 71) is used, the mine can be set off by either pressure or pressure release.

(a) *Pressure.* Pressure of from 250 to 400 pounds applied to the hexagonal pressure plug or to the pressure plate forces the pressure sleeve down until the main shear pin rests against the top of the fuze case. The pressure then shears the main shear pin, forcing the pressure sleeve down until the striker-retaining balls escape into the upper recess, releasing the spring-loaded striker against the percussion cap and firing the mine.

(b) *Pressure release.* Unscrewing the hexagonal pressure plug allows the pressure sleeve to ride up under the force of the compressed striker spring until the two striker-retaining balls escape into the lower recess, releasing the spring-loaded striker against the percussion cap and firing the mine.

(2) If the Tellermine fuze 42 (fig. 72) is used, the mine can be set off by pressure only. Pressure of about 570 pounds applied to the hexagonal pressure plug or to the pressure plate forces the pressure plug against the protruding striker shaft with sufficient force to shear the shear pin, releasing the spring-loaded striker against the percussion cap and firing the mine.

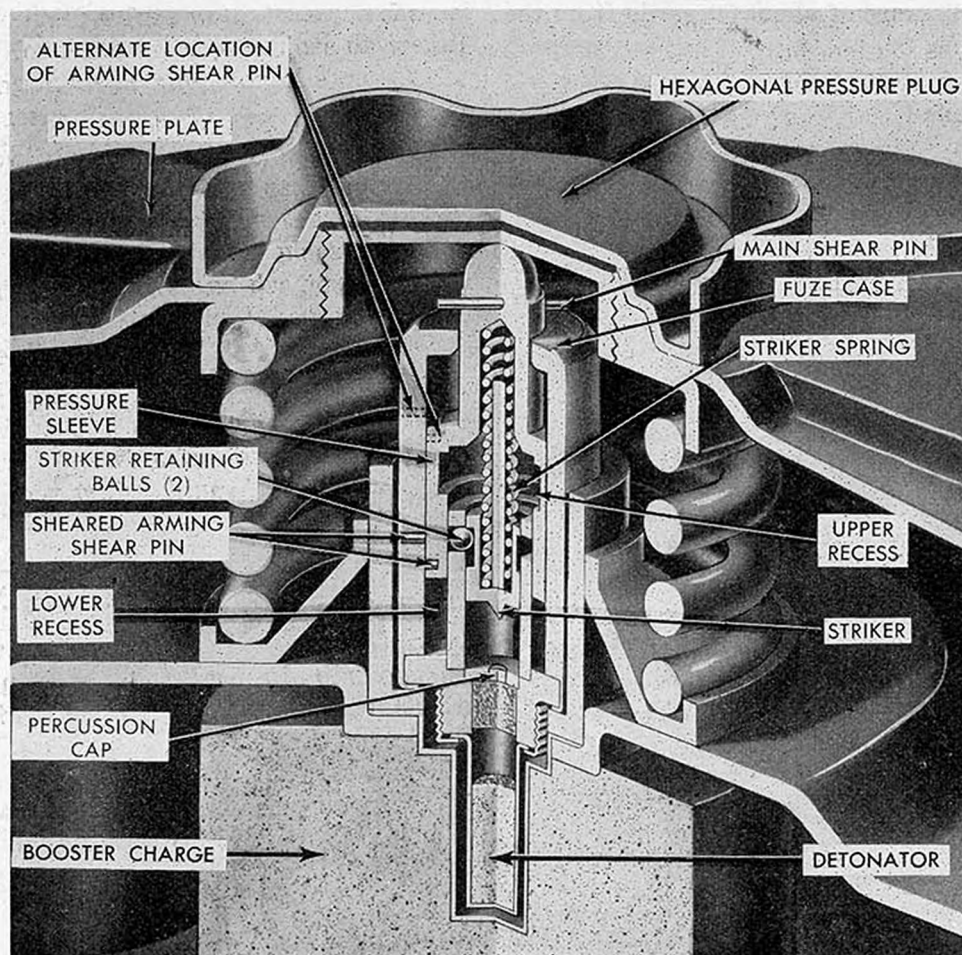


Figure 71. Tellermine 42 with Tellermine fuze 43.



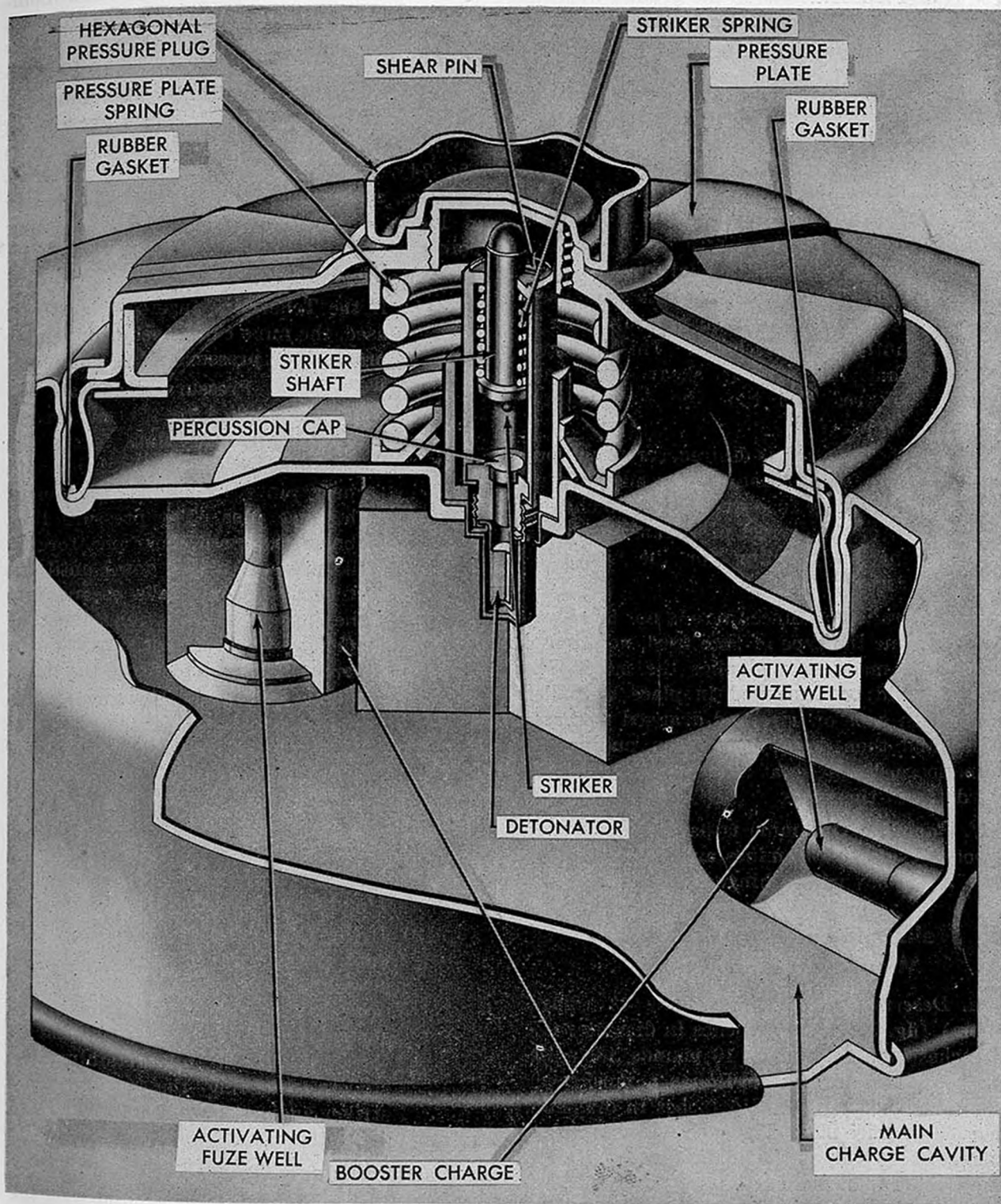


Figure 72. Tellermine 42 with Tellermine fuze 42.



*d. Installing and Arming.*

- (1) Place the mine in the ground with the carrying handle horizontal or down.
- (2) Unscrew the hexagonal pressure plug from the main fuze well.
- (3) Screw a detonator-retaining collar, with the detonator, to the base of a Tellermine fuze 42 or 43.
- (4) Insert the Tellermine fuze 42 or 43, with detonator, into the main fuze well.
- (5) Screw in the hexagonal pressure plug. If the Tellermine fuze 43 is being used, screw the hexagonal pressure plug in until a click is heard. This indicates that the arming shear pins have sheared and that the fuze is now armed.
- (6) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming for the activating fuze.

*e. Neutralizing.* Since there is no visual way to determine the type of fuze used, no attempt should be made to neutralize the mine. The mine should be destroyed in place or pulled loose with rope or wire and dragged to a safe place and then destroyed. When pulling the mine loose, lie prone at a distance of about 50 yards from the mine.

*f. Packing.* One mine is packed in an open wooden crate or two mines are packed on edge in a metal box with a hinged lid.

## **65. Tellermine 43 (Mushroom, Pilz) (T. Mi. 43 (P))**

*a. Description.* The Tellermine 43 (mushroom) (fig. 73) is 12½ inches in diameter and 4 inches high. It weighs 18 pounds, including 12 pounds of explosive. It has a mushroom-shaped pressure plate, 7½ inches in diameter, but no pressure plug. The entire pressure plate unscrews to reveal the main fuze well. The Tellermine 43 has two activating fuze wells, one in the bottom and one in the side. A carrying handle is provided. This mine uses the Tellermine fuze 42 (par. 16) or 43 (par. 33) in the main fuze well.

*b. Employment.* This mine is used in road blocks and defense systems. The mushroom-shaped pressure plate acts as a cover to make the mine more weatherproof than the other Tellermines and causes it to function well under all types of weather conditions. This mine and other Tellermines were sometimes encased in earthenware or concrete waterproofing slabs (fig. 74). Because of the waterproofing characteristics, such mines are employed underwater at likely assault landing or stream crossing points.

*c. Functioning.*

- (1) If the Tellermine fuze 43 (fig. 37) is used, the mine can be set off by either pressure or pressure release.
  - (a) *Pressure.* Pressure of at least 570 pounds applied to the mushroom-shaped pressure plate forces the pressure sleeve down until the main shear pin rests against the top of the fuze case. The pressure then shears the main shear pin, forcing the pressure sleeve down until the striker-retaining balls escape into the upper recess, releasing the spring-loaded striker against the percussion cap and firing the mine.
  - (b) *Pressure release.* Unscrewing the mushroom-shaped pressure plate allows the pressure sleeve to ride up under the force of the compressed striker spring until the two striker-retaining balls escape into the lower recess, releasing the spring-loaded striker against the percussion cap and firing the mine.
- (2) If the Tellermine fuze 42 (fig. 20) is used, the mine can be set off by pressure only. Pressure of at least 570 pounds applied to the mushroom-shaped pressure plate is sufficient to shear the shear pin retaining the striker, releasing the spring-loaded striker against the percussion cap and firing the mine.

*d. Installing and Arming.*

- (1) Place the mine in the ground with the carrying handle horizontal or down.
- (2) Unscrew the mushroom-shaped pressure plate from the fuze well.

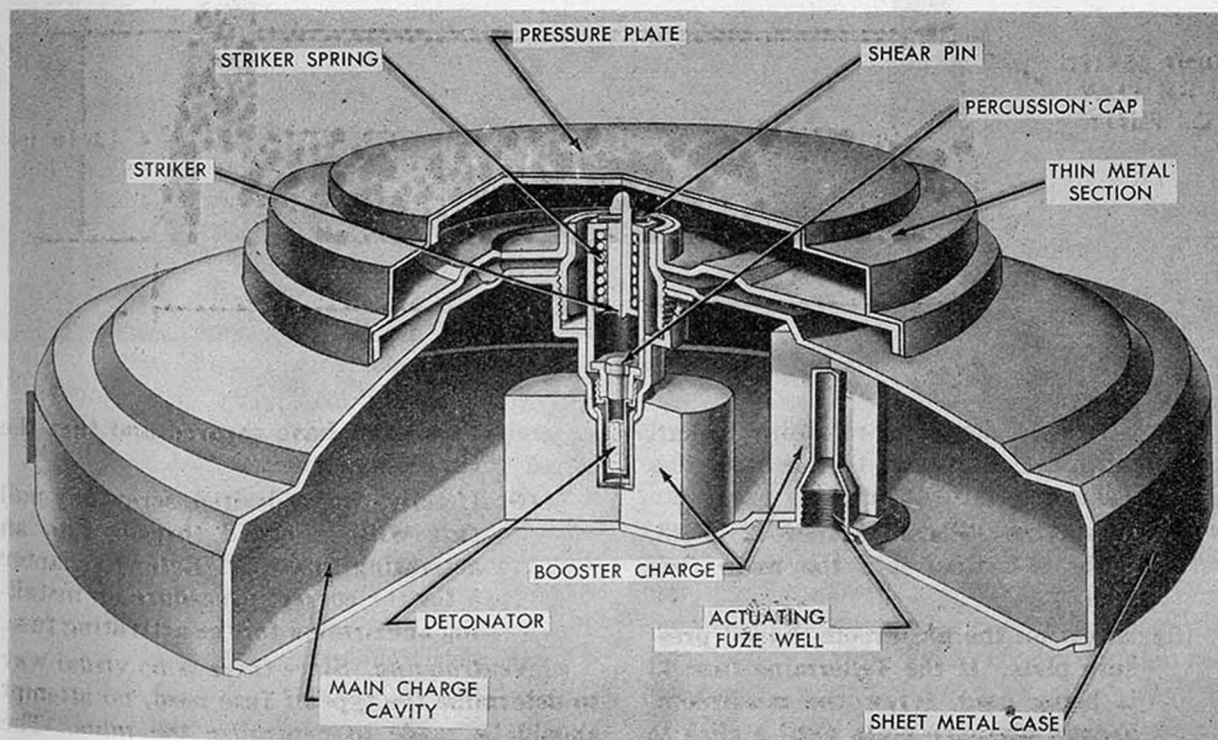
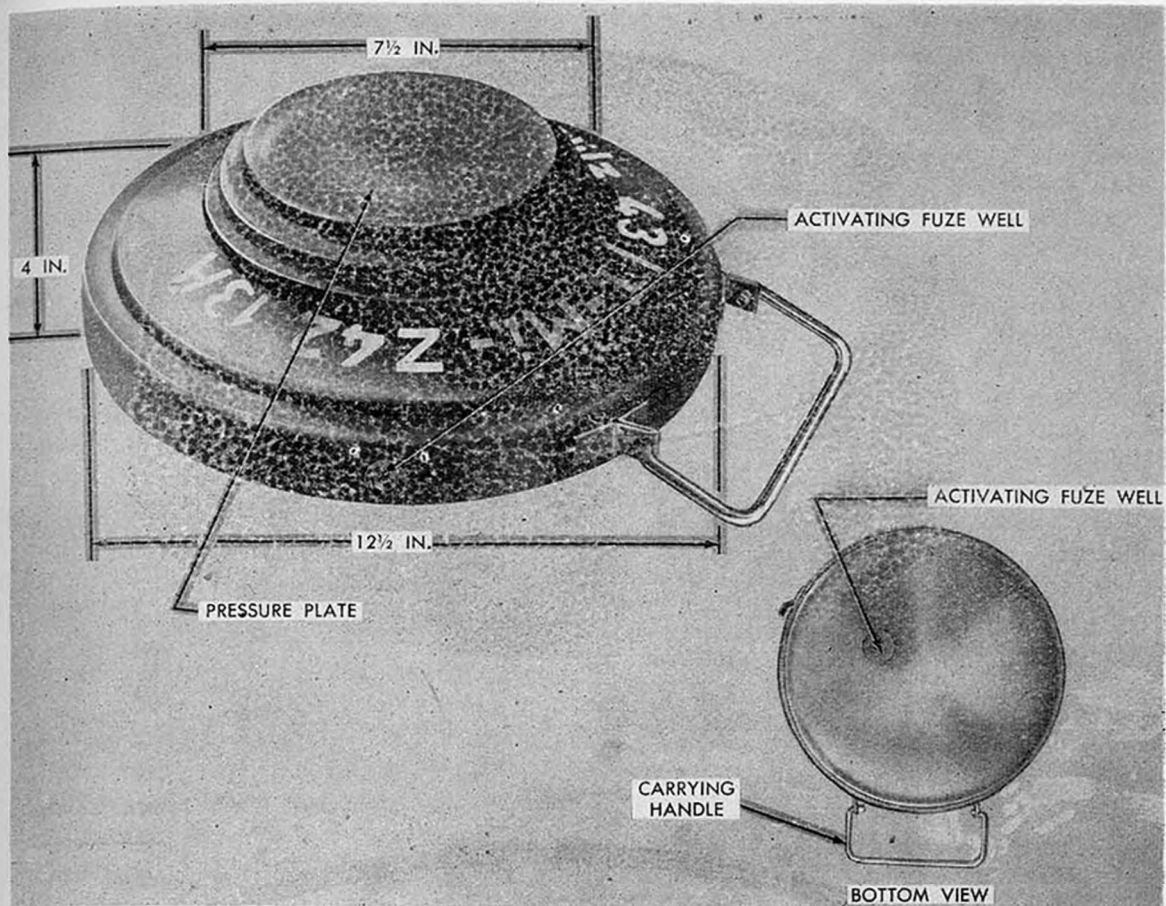


Figure 73. Tellermine 43 (mushroom) with Tellermine fuze 42.

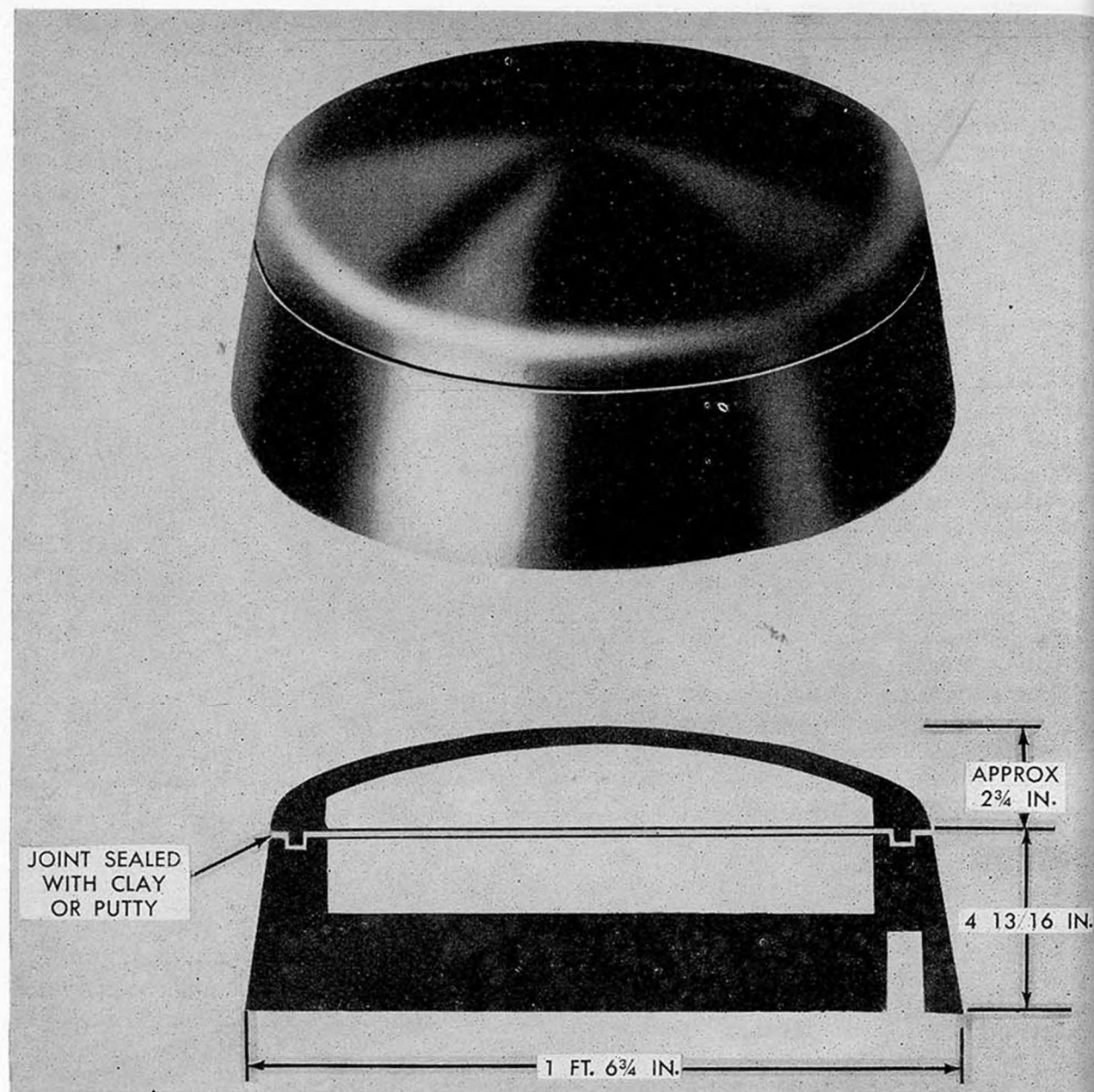


Figure 74. An earthenware pot for Tellermines.

- (3) Screw a detonator-retaining collar, with the detonator, to the base of a Tellermine fuze 42 or 43.
- (4) Insert the Tellermine fuze 42 or 43, with detonator, into the main fuze well.
- (5) Screw on the mushroom-shaped pressure plate. If the Tellermine fuze 43 is being used, screw the mushroom-shaped pressure plate until a click is heard. This indicates that the arming

shear pins have sheared and that the fuze is now armed.

- (6) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming for the activating fuze.

*e. Neutralizing.* Since there is no visual way to determine the type of fuze used, no attempt should be made to neutralize the mine. The mine should be destroyed in place or pulled



loose with rope or wire and dragged to a safe place and then destroyed. When pulling the mine loose, lie prone at a distance of about 50 yards from the mine.

*f. Packing.* One mine is packed in an open wooden crate or two mines are packed on edge in a metal box with a hinged lid.

## 66. Bar Mine 43 (Riegelmine 43; R-Mine 43; R.Mi. 43)

*a. Description.* The antitank bar mine 43 (fig. 75) is 31½ inches long, 3½ inches high, and 3¾ inches wide. It weighs 20.5 pounds, including 8.8 pounds of explosive. The mine has three main parts: a steel tray, the metal-encased main charge, and a steel lid which fits over the tray and acts as a pressure plate.

- (1) *Tray.* The tray is folded over at each end and slotted so the striker shafts of pull fuzes 42 will just clear the slots in these actuating plates. Holes for a safety bar and shear wire (on which the main charge rests) are located in the sides of the tray at each end. A neutralizing hole is located in the bottom of the tray at each end for inserting a nail or wire. A hinged, spring-loaded shutter at each end of the tray closes the safety-bar holes when the mine is armed. A swivel clip covers the slotted actuating plates when the main charge is in place.
- (2) *Main charge.* The main charge has two main fuze wells, one at each end of the charge, and three activating fuze wells, one in the top of the charge and two on one side. The main fuze wells are fitted with the pull fuze 42 (par. 42).
- (3) *Steel lid.* The steel lid has a carrying handle at one end; a pair of slots at each end to slide over the safety bars; a pair of shear-wire holes at each end through which the shear wires are inserted, passed underneath the main charge, and bent over the top of the lid to hold the charge in place; and holes for the activating fuzes. The lid fits over the charge and the tray.

*b. Employment.* Because of its length, this mine is best employed in the support of road

blocks and in junctions and turnouts. Fewer of these mines are necessary to block a road or to construct a mine field than conventional round mines.

*c. Functioning.* A pressure of 400 pounds on either end of the lid, or 800 pounds on the center, shears one or both shear wires and forces the striker-retaining pin out of the striker shaft of one or both fuzes, releasing the spring-loaded striker against the percussion cap and firing the mine. Less pressure is required when thinner shear wires are used.

### *d. Installing and Arming.*

- (1) Press down the spring-loaded shutters and insert the safety bars.
- (2) Screw a pull fuze 42 into the main fuze well in each end of the metal-encased main charge.
- (3) Open the swivel clips toward the ends of the mine and insert the main charge so it is resting on the safety bars with the wings of the fuze striker-retaining pins above the slotted shoulders on the ends of the tray. Close the swivel clips.
- (4) Place the lid over the main charge and thread the shear wires through the holes in the side of the lid. Pull the ends of the shear wire up and over the lid and fasten them as shown in figure 80.
- (5) Withdraw the safety bars.
- (6) If activating is desired, screw any pull fuze with standard threads into an activating fuze well. Refer to chapter 5 for the correct procedure on installing and arming for the activating fuzes.

*Note.* By reversing one pull fuze 42 so its wings are below the slotted shoulder, the mine will function when an attempt is made to lift the main charge from the tray.

*e. Neutralizing.* Neutralizing this mine is dangerous, especially if the shear wires are rusted or thin shear wires are used. Whenever practicable, it should be destroyed in place by hand-placed charges or pulled loose from a distance of 50 yards with rope or wire and then destroyed in a safe place. If this mine must be neutralized, proceed as follows:

- (1) Check for and neutralize any activating fuzes in the normal manner.

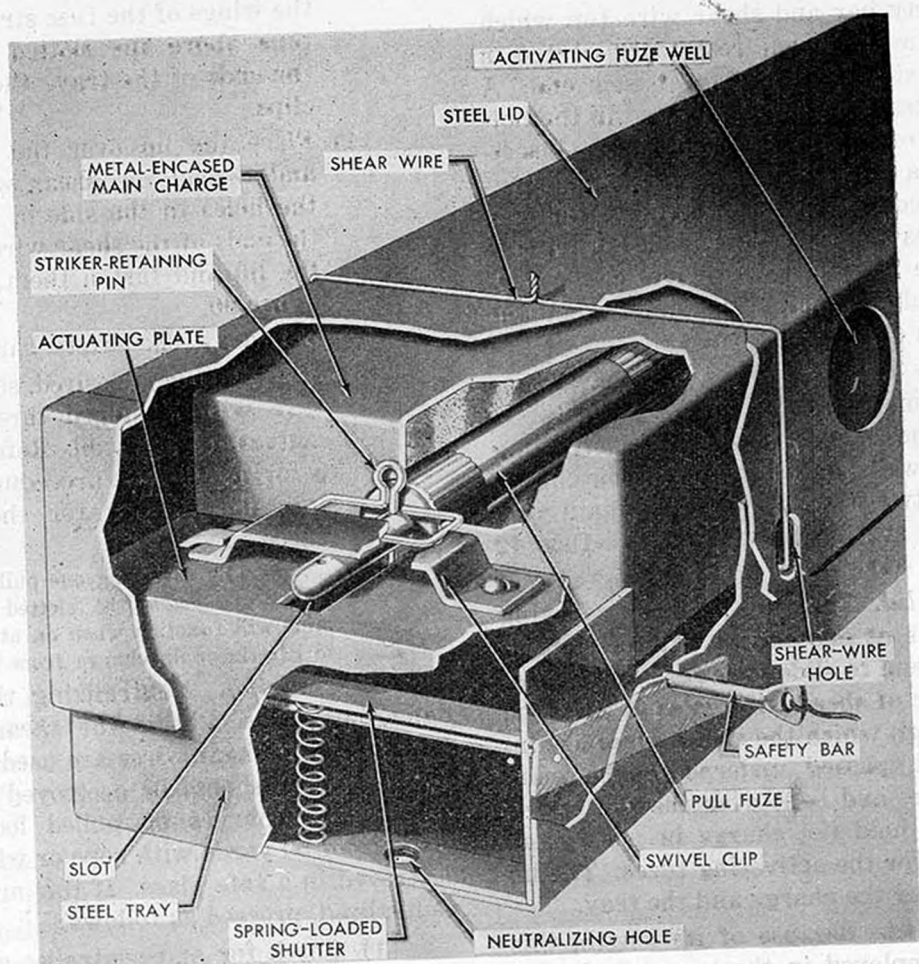
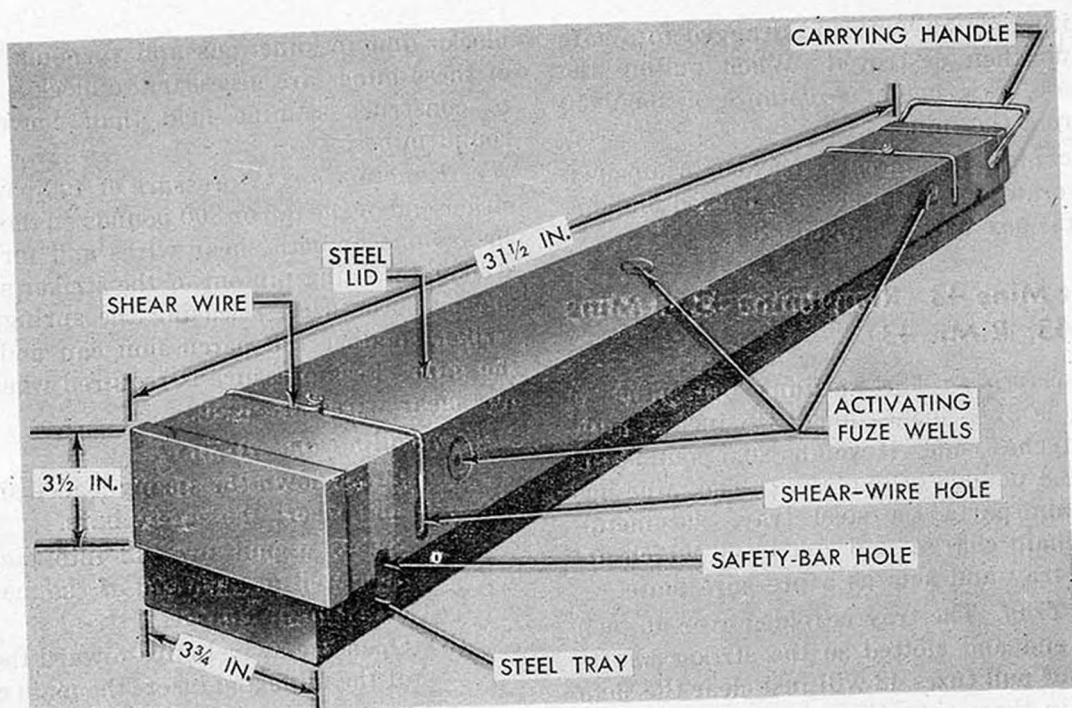


Figure 75. Bar mine 43.

- (2) Lift one end of the mine.
- (3) Insert a pencil, a 6-inch nail, or a stiff wire into the neutralizing hole in the bottom and press up on the spring-loaded shutter, clearing the safety-bar hole.
- (4) Push a 6-inch nail through the safety-bar hole.
- (5) Repeat steps (2), (3), and (4) at the other end of the mine.
- (6) Carefully cut the shear wires and lift the lid.
- (7) Open both swivel clips and inspect the pull fuzes 42 to see if the wings of the striker-retaining pins are under the slotted shoulder. If both wings are on top, lift out the metal-encased main charge. If one wing is underneath, raise the other end of the charge and carefully slide the charge out along the axis of the mine.
- (8) Unscrew and remove the fuzes.

**f. Packing.**

- (1) This mine is shipped singly in a wooden packing case with the main fuzes and the safety bars in position.
- (2) Protective paper strips cover the activating fuze wells in the lid. Cords

attached to the safety bars are wound around the mines.

**67. Bar Mine (17.6-Pound) (Sprengriegelmine 8 Kilogram; Sp. R-Mi. 8 Kg; Sp.R. 8 Kg)**

*a. Description.* The antitank bar mine (17.6-pound) (fig. 76) is similar to the bar mine 43, (par. 66), which superseded this mine, except that it has no steel lid and it has a different type of arming device. This mine is  $32\frac{3}{4}$  inches long, 4 inches wide, and  $3\frac{3}{4}$  inches high. It consists of a metal-encased main charge, weighing about 18 pounds. The main charge rests on two shear wires inside a metal tray. The mine uses two pull fuzes 42 (par. 42) which are modified by cutting off the end of the striker shaft and its outer hole.

**(1) Tray.**

- (a) The tray is ribbed lengthwise slightly above the shear-wire holes. The under side of the tray is marked *Unten* (bottom). A shear wire is threaded through holes 4 inches from each end of the tray. About  $1\frac{1}{2}$  inches from each end of the tray is another set of holes for the insertion of safety bars. The holes

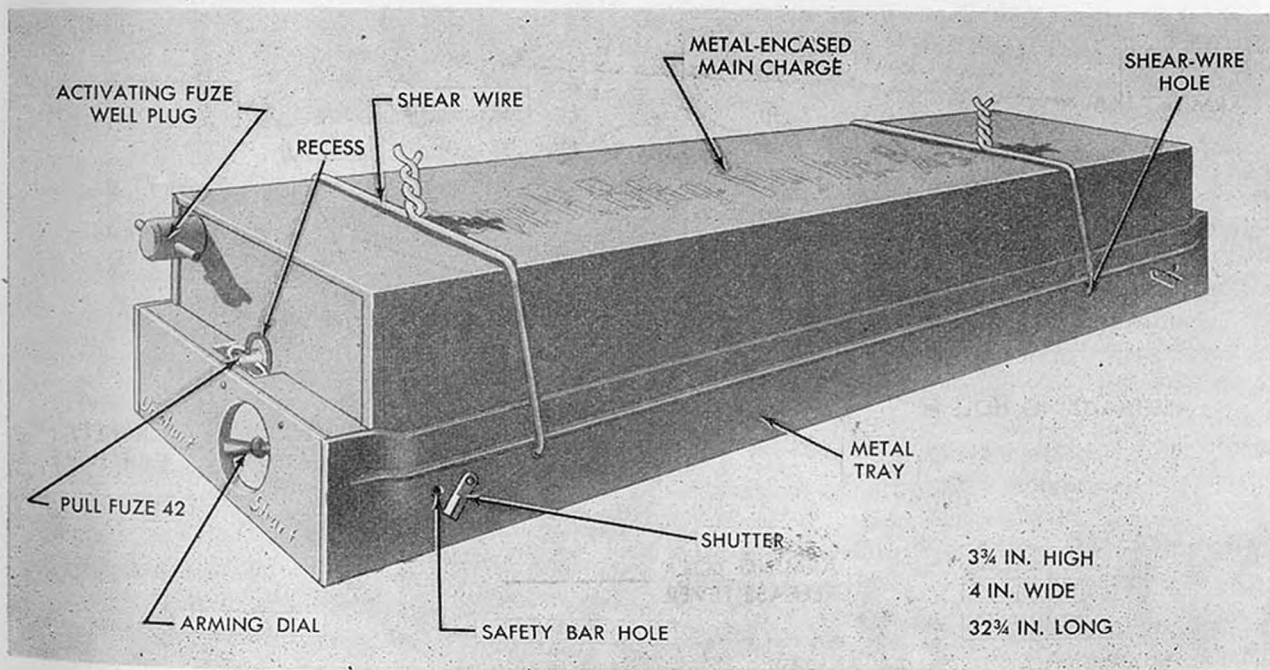


Figure 76. Bar mine (17.6-pound).



for the safety bars may be closed by small, hinged shutters. The ends of the tray are folded over on top. One end is solid, and the other is slotted (fig. 77) to permit passage of the wings of the striker-retaining pin of the fuze.

- (b) At both ends of the tray are pivoted arming dials which can be turned so the indicator points at the word *scharf* (armed) or *unscharf* (unarmed). In the unarmed position, the slotted striker-retaining-pin rest, attached to the inside face of the arming dial, is pivoted at a 90-degree angle, away from the fuze (fig. 77). This safeguards the mine against accidental firing if the shear wires are prematurely sheared. In the armed position, the slotted striker-retaining-pin rest is brought directly under the wings of the

striker-retaining pin of the fuze and is locked in this position by the spring-loaded arming lock. The arming lock release lever is directly above the neutralizing hole in the bottom of the tray.

- (2) *Main charge.* The main charge is within a metal case which is recessed at both ends to receive the pull fuzes. Only the winged striker-retaining pins can be seen when the fuzes are screwed into the main charge. In the upper left-hand corner, at each end of the charge, is an activating fuze well which is closed with a metal plug when not in use.

b. *Employment.* This mine is employed in the support of road blocks and in antitank mine fields. Because of its shape fewer rail mines are needed to block a road or to construct a mine field.

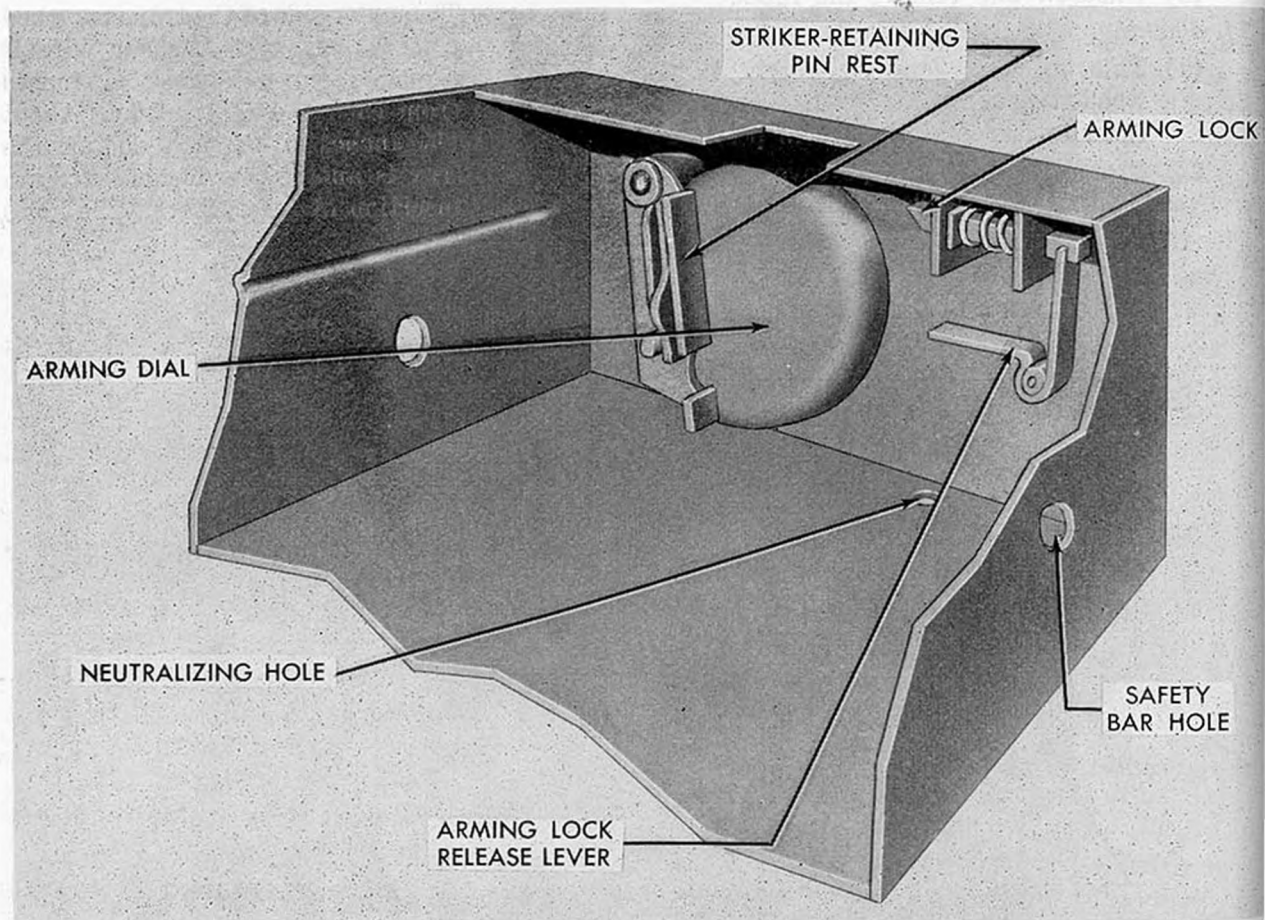


Figure 77. Arming mechanism of the tray.

c. *Functioning.* A pressure of 400 pounds at either end of the main charge, or 800 pounds in the center, shears one or both shear wires and forces the striker-retaining pin out of the striker shaft of one or both fuzes, releasing the spring-loaded striker against the percussion cap and firing the mine.

d. *Installing and Arming.*

- (1) With a nail or stiff wire inserted through the neutralizing hole in the bottom of the tray, press up the arming lock release lever which pulls back the arming lock, releasing the striker-retaining-pin rest.
- (2) Turn the arming dial, at each end, so that the arrow points to *unscharf*.
- (3) Insert the shear wires and the safety bars through their respective holes in the tray.
- (4) Insert a pull fuze 42 into the fuze well at each end of the main charge, and turn them so the wings of the striker-retaining pins are up.
- (5) Slide one end of the main charge into the solid end of the tray and lower the charge so it rests on the safety bars and the shear wires.
- (6) Twist the shear wires together over the main charge so the charge is secure in the tray.
- (7) Turn the arming dials from *unscharf* (unarmed) to *scharf* (armed). This action rotates the striker-retaining-pin rests on the rear face of the arming dials so the recesses are positioned directly under the striker-retaining pins in the fuzes. The spring-loaded arming locks lock the striker-retaining-pin rests in position.
- (8) Remove the safety bars.

*Note.* One or both of the striker-retaining pins may be reversed so the wings are down instead of up. This acts as booby-trap and will cause the mine to detonate if the main charge is lifted.

e. *Neutralizing.* This mine should be destroyed in place or pulled out with a 50-yard rope or wire to a safe place and then destroyed. If neutralizing is necessary, proceed as follows:

- (1) Check for and neutralize any activating fuzes.

- (2) Lift one end of the mine.
- (3) Insert a long stiff wire or a 6-inch nail into the safety-bar hole and push through the hole on the other side of the tray.
- (4) Repeat step (3) at the other end of the mine.
- (5) Carefully cut the shear wires.
- (6) Inspect the striker-retaining pins to see if the wings are *on top* of the recesses of the striker-retaining-pin rests. If they are both on top of the recesses of the rests, then insert a nail or stiff wire through the neutralizing holes in the bottom of the tray and press up the arming lock release levers, which pull back the arming locks, releasing the striker-retaining-pin rests; and turn the arming dials to *unscharf* (unarmed). If one pin is below the recess, do not turn that particular arming dial to *unscharf*. Instead, carefully lift the opposite end of the main charge and gently slide the charge out until the reverse fuze is clear of the recessed striker-retaining-pin rest.
- (7) Lift the main charge and unscrew both fuzes and their detonators.

f. *Packing.* Mines are shipped singly in a wooden packing case with the main fuzes and the safety bars in position.

## 68. Bar Mine 44 (Riegelmine 44; R.Mi. 44)

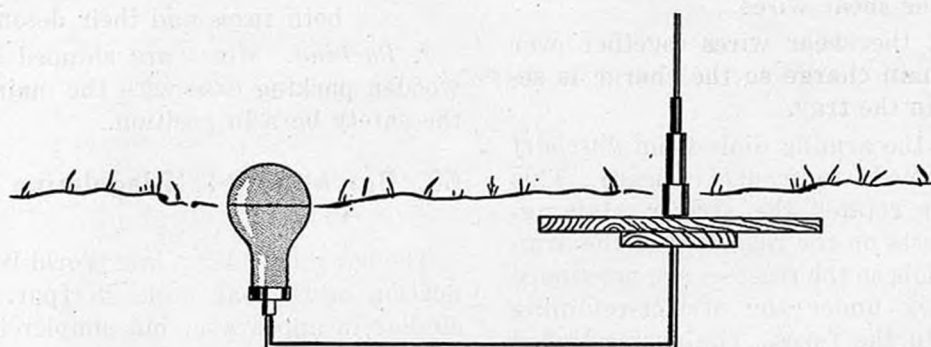
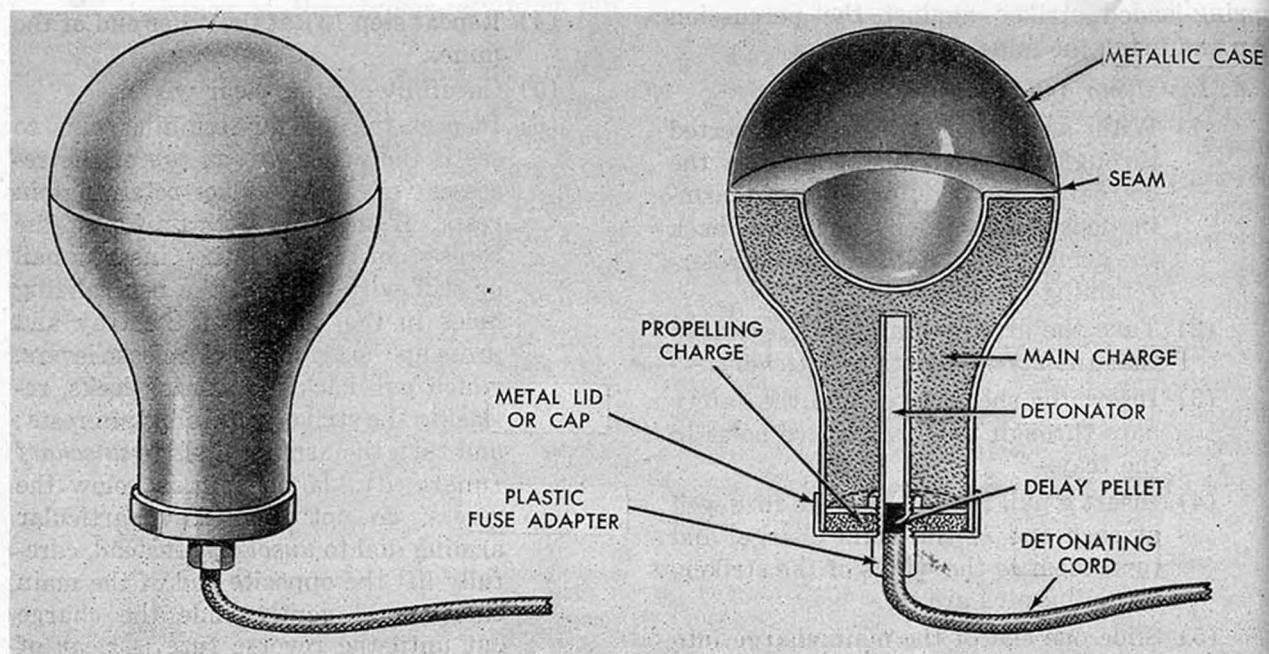
The bar mine 44 is a late World War II modification of the bar mine 43 (par. 66), being similar in appearance but simpler in construction. It has no tray or lid. It has five fuze wells, one at each end, one in the center of the top of the mine, and two in the bottom of the mine. The bottom fuze wells are the main fuze wells. They are for Tellermine fuzes 42 or 43 which are inserted upside down and covered by a pressure plate. The mine was produced only as an experimental model.

## 69. Hollow-Charge Mine (Hohlladungsmine)

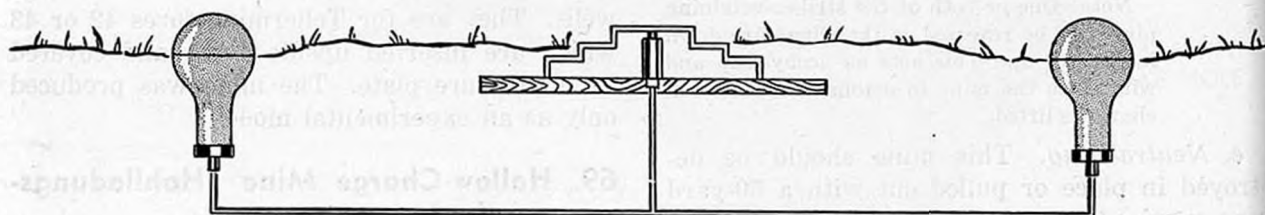
a. *Description.* The antitank hollow-charge mine (fig. 78) consists of a hemispherical, 3.5-pound hollow main charge encased in sheet

metal. It contains a propelling charge capable of lifting the mine 3 feet into the air. The propelling charge is connected to the fuze by 2 to 3

feet of detonating cord. The fuze may be the snap fuze 43/I (par. 18), the snap fuze 43/II (par. 19), or the Tellermine fuze 42 (par. 16).



WITH SNAP FUZE 43/I OR 43/II.



TELLERMINE FUZE 42

Figure 78. Hollow-charge mine.



b. *Employment.* This mine is employed as an antitank mine and is laid with one or two mines to each fuze.

c. *Functioning.*

(1) *With the snap fuze 43/I (par. 18).* A sideward pressure exerted on the extension rod of the fuze bends it and causes the pull chain to pull the shear strip upward until the buffer is reached. Further pressure shears the shear strip, releasing the spring-loaded striker against the percussion cap and firing the detonating cord. The detonating cord fires the propelling charge and ignites the delay pellet. The propelling charge lifts the mine about 3 feet into the air or until it strikes the underside of a tank or vehicle. The delay pellet fires the detonator and the main charge.

(2) *With the snap fuze 43/II (par. 19).* A sideward pressure exerted on the extension rod of the fuze breaks it at the shear groove and snaps the plastic shear rod, releasing the spring-loaded striker against the percussion cap and firing the detonating cord. The detonating cord fires the propelling charge and ignites the delay pellet. The propelling charge lifts the mine about 3 feet into the air or until it strikes the underside of a tank or vehicle. The delay pellet fires the detonator and the main charge.

(3) *With the Tellermine fuze 42 (par. 16).* A pressure of at least 570 pounds on the mushroom-shaped pressure plate crushes the plate and shears the shear pin in the fuze, releasing the spring-loaded striker against the percussion cap. The percussion cap fires the detonating cord, which, in turn, fires the propelling charge and ignites the delay pellet. The propelling charge lifts the mine about 3 feet into the air or until it strikes the underside of a tank or vehicle. The delay pellet fires the detonator and the main charge.

d. *Installing and Arming.*

(1) *With the snap fuze 43/I (fig. 78).*

(a) Install the fuze in a board or impro-

vised device on the surface of the ground so that it will break instead of giving way or tilting when a sideward pressure is exerted on the extension rod.

(b) Insert a detonator and a delay pellet into the mine.

(c) Connect the mine to the fuze with 2 to 3 feet of detonating cord, using fuze adapters.

(d) Dig a hole and install the individual mines upright with the seam in the metal case at ground level. Make a groove in the surface of the ground and bury the detonating cord.

(e) Remove the safety-pin-retaining wire from the fuze.

(f) Remove the safety pin from the fuze by means of the attached safety-pin-removal wire.

(2) *With the snap fuze 43/II (fig. 78).*

(a) Install the fuze in a board or improvised device on the surface of the ground so that it will break instead of giving way or tilting when a sideward pressure is exerted on the extension rod.

(b) Insert a detonator and delay pellet into the mine.

(c) Connect the mine to the fuze with 2 to 3 feet of detonating cord, using fuze adapters.

(d) Dig a hole in the ground and install the individual mines upright with the seam in the metal case at ground level. Make a groove in the surface of the ground and bury the detonating cord.

(e) Remove the safety collar from the fuze by sliding it upward and off the extension rod.

(3) *With the Tellermine fuze 42 (fig. 78).*

(a) Install the fuze in a board or improvised device on the surface of the ground.

(b) Insert a detonator and a delay pellet into the mine.

(c) Connect the mine to the fuze with 2 to 3 feet of detonating cord, using fuze adapters.

- (d) Dig a hole in the ground and install individual mines upright with the seam in the metal case at ground level. Make a groove in the ground and bury the detonating cord.
- (e) Place a mushroom-shaped pressure plate from a Teller mine 43 over the fuze so the pressure plate is flush with the surface of the ground. (The fuze has no safeties and is armed once the detonating cord is attached.)

*Note.* In each of the procedures described above the detonating cord should be at right angles to the line of probable approach of tanks. If two mines are used, one is laid on each side of the fuze.

#### e. Neutralizing.

- (1) *With the snap fuze 43/I.* Do not move the extension rod. The fuze may have been partially broken or subjected to blast, and any movement might cause detonation of the mine.
  - (a) Replace the safety pin, using the original pin, a nail, or a heavy wire, and fix it firmly to the fuze by wiring it in place.
  - (b) Very carefully uncover and cut the detonating cord near the fuze. Do not pull or disturb the detonating cord while uncovering or cutting it since it may cause the fuze to function.
  - (c) Remove the detonating cord and the detonator from the mine.
  - (d) Remove the detonating cord from the fuze.
- (2) *With the snap fuze 43/II.* A mine using this fuze should be detonated in place since the only safety device is the safety collar, which will probably not be available. Improvised safety devices are difficult to construct. If neutralizing is necessary, proceed as follows:
  - (a) Very carefully uncover and cut the detonating cord near the fuze. Do not pull or disturb the detonating cord while uncovering or cutting it since it may cause the fuze to function.

- (b) Remove the detonating cord and the detonator from the mine.
- (c) Remove the detonating cord from the fuze.
- (3) *With the Teller mine fuze 42.* The fuze has no safeties and is armed once the detonating cord is attached.
  - (a) Uncover and cut the detonating cord near the fuze.
  - (b) Remove the detonating cord and the detonator from the mine.
  - (c) Remove the detonating cord from the fuze.

### 70. Antitank Stake Mine 43 (Panzer Stab Mine 43; Pz. Stab Mi. 43)

*a. Description.* The antitank stake mine 43 (fig. 79) has a main charge consisting of a parabolic hollow-shaped charge with a zinc lining. The metal container containing the main charge is screwed onto a metal cylinder. The metal cylinder has a partition in it which forms two chambers, a flash chamber, and receptacle for the wooden stake. A flash tube with a fuze well is welded to the metal cylinder at the flash chamber. The detonator-and-booster-charge assembly is a standard German Zundladung 34. A square wooden stake, 15 $\frac{1}{4}$  inches long and rounded at the top, fits into the lower part of the metal cylinder. A thin metal cover, 4 $\frac{5}{16}$  inches in diameter, is crimped over the top of the mine. This mine is designed to punch a hole through the under side of a tank. The fuze may be either the snap fuze 43/I (par. 18) or the snap fuze 43/II (par. 19).

*b. Employment.* This mine is laid in snow, brush, or tall grass in likely avenues of approach for tanks.

*c. Functioning.* A sideward pressure exerted on the extension rod of the fuze actuates the fuze. The flash from the percussion cap fires the detonator-and-booster-charge assembly and the main charge.

*d. Installing and Arming.* Dig a hole in the ground so the top of the mine will be flush with the surface of the ground when it is placed on the stake. Drive the stake into the ground until only the rounded top portion remains above the bottom of the hole. Place the mine on the

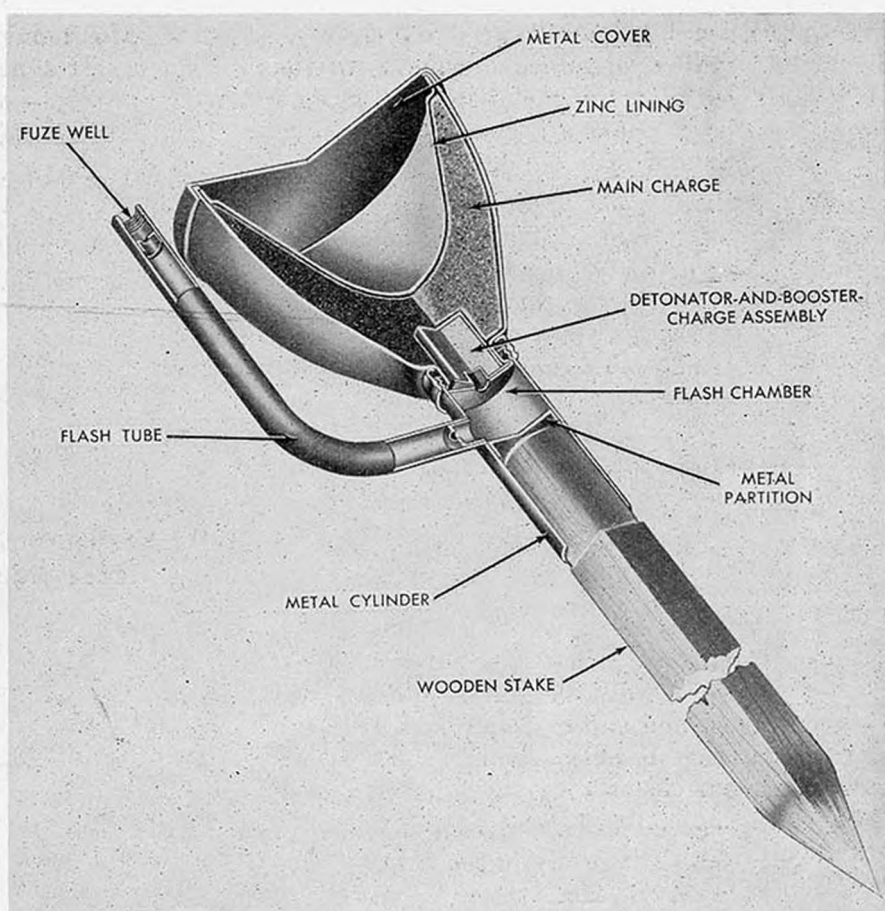
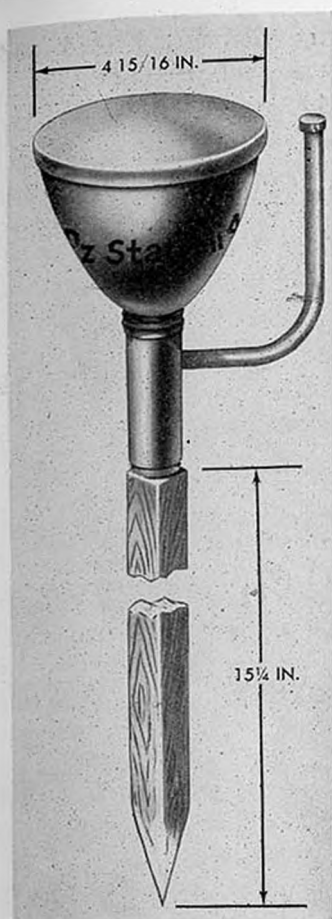


Figure 79. Antitank stake mine 43.

stake and screw a snap fuze 43/I or 43/II into the fuze well.

(1) *With the snap fuze 43/I.*

- Remove the safety-pin-retaining wire from the fuze.
- Remove the safety pin from the fuze by means of the attached safety-pin-removal wire.

(2) *With the snap fuze 43/II.* Remove the safety collar from the fuze by sliding it upward and off the extension rod.

e. *Neutralizing.*

(1) *With the snap fuze 43/I.* Do not move the extension rod. The fuze may have been partially broken or subjected to blast, and any movement might cause detonation of the mine.

- Replace the safety pin, using the original pin, a nail, or a heavy wire, and fix it firmly to the fuze by wiring it in place.

(b) Unscrew the fuze from the mine.

(c) Disassemble the mine, removing the detonator-and-booster-charge assembly from the main charge.

(2) *With the snap fuze 43/II.* A mine using this fuze should be detonated in place since the only safety device is the safety collar, which will probably not be available. Improvised safety devices are difficult to construct. If neutralizing is absolutely necessary, very carefully unscrew the fuze from the mine. Then disassemble the mine, removing the detonator-and-booster-charge assembly from the main charge.

f. *Packing.* Five main charges, with metal cylinders and wooden stakes, are packed in a wooden crate (fig. 80). The fuzes are packed separately.





Figure 80. Packing case for the antitank stake mine 43.

## 71. Wooden-Box Mine 42 (Holzmine 42; H.Mi. 42)

*a. Description.* The antitank wooden-box mine 42 (fig. 81) consists of a wooden mine case 13 inches long, 12 inches wide, and 4½ inches high. The mine case is divided into four compartments. The compartment across the front of the mine case contains the fuze and the fuze actuating mechanism. The two partitions for the other three compartments are at right angles to the partition for the front compartment. The narrow compartment containing the booster charge separates the two compartments containing the main charge. The fuze actuating mechanism consists of three parts: a wooden fuze-support block with a U-shaped slot in it, a wooden fuze-actuating flange secured to the outside wall of the mine case by two wooden dowels, and a wooden pressure

block (see fig. 82 for shape) that fits into a hole in the cover of the mine. The fuze-actuating flange has a slot so it will clear the striker shaft of the pull fuze 42 but not the wings of the striker-retaining pin. The cover is positioned on the mine case by wooden pegs and is secured at the front and back by metal hooks. Directly opposite the hole in the cover for the pressure block a stocking block is attached to provide a level support for stacking mines on top of each other. The mine weighs 18 pounds, including 11.5 pounds of explosive in a main charge of two 5-pound cast charges and a booster charge of three 200-gram blocks (about 1.5 pounds). One side of the pressure block is painted red, and when the pressure block is in the armed position, a continuous red band about 4 inches wide shows down the front of the mine (fig. 81). The mine uses the pull fuze 42 (par. 42).

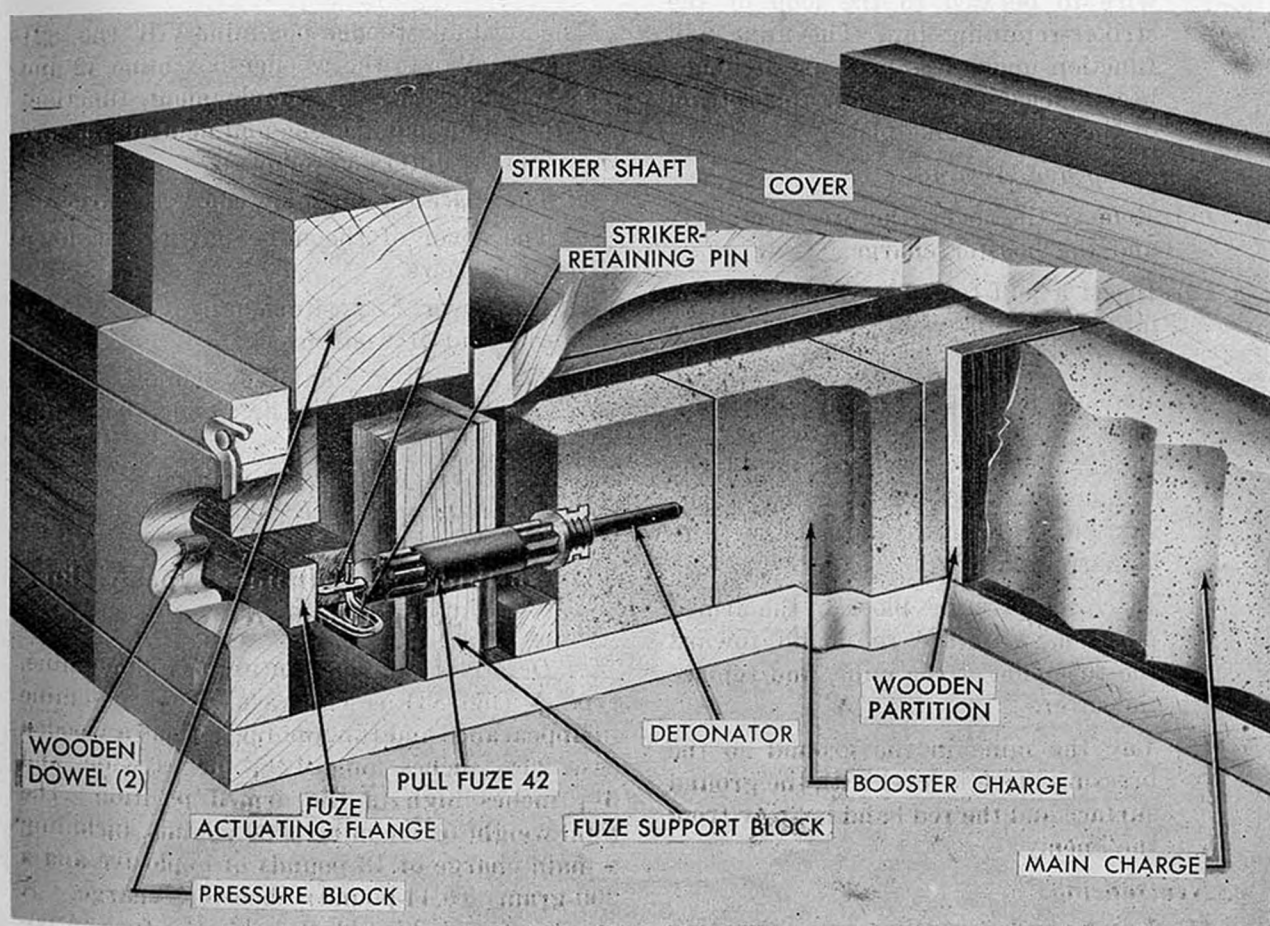
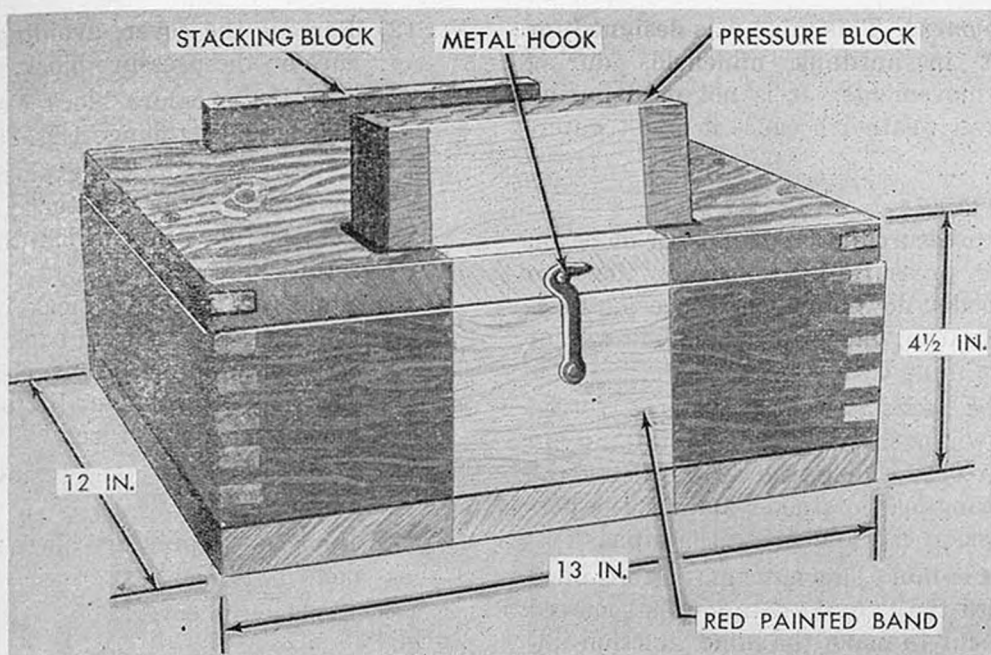


Figure 81. Wooden-box mine 42.



*b. Employment.* This mine was designed for employment in antitank minefields during retrograde movements. It is not used during periods of wet weather because it is not waterproof.

*c. Functioning.*

- (1) A pressure of 200 pounds, or more, on the pressure block shears the two wooden dowels which secure the fuze-actuating flange to the outside wall of the mine case.
- (2) The fuze-actuating flange, forced down, pushes the striker-retaining pin out of the pull fuze 42, releasing the spring-loaded striker against the percussion cap and firing the mine.

**Caution:** This mine may be installed with the two wooden dowels removed or cut to make the mine function under foot pressure. It may also have a hole drilled under the fuze for a pull wire to be tied to the loop of the striker-retaining pin. The mine will function under less pressure if it has been buried long enough for rotting of the wood to take place.

*d. Installing and Arming.*

- (1) Remove the cover, the pressure block, and the booster charge.
- (2) Insert a pull fuze 42, with detonator, into the fuze well of the booster charge.
- (3) Replace the booster charge so the fuze rests in the U-shaped slot of the fuze-support block with the wings of the striker-retaining pin below the striker shaft and under the slot in the fuze-actuating flange.
- (4) Place the pressure block in the armed position, with the red band toward the fuze side of the mine, and replace the cover.
- (5) Lay the mine in the ground so the pressure block is level with the ground surface and the red band is away from the enemy.

*e. Neutralizing.*

- (1) Locate and neutralize any activating fuzes.

- (2) Remove the cover, avoiding all pressure on the pressure block.
- (3) Lift the pressure block clear of the fuze-actuating flange (fig. 83).
- (4) Remove one of the explosive blocks constituting the booster charge, but *not* the one into which the fuze is screwed.
- (5) Slide the explosive block into which the fuze is screwed back until the striker-retaining pin is clear of the fuze-actuating flange; lift out the explosive block and fuze.
- (6) Unscrew the fuze and remove the detonator.
- (7) Replace the pressure block so the red band is to the rear.
- (8) Replace the cover.

## 72. Wooden-Box Mine V.B. (Holzmine V.B.Mi. 1)

The antitank wooden-box mine V.B. (fig. 82) is very similar to the wooden-box mine 42 and uses the same fuze. Its employment, functioning, installing and arming, and neutralizing are the same. It differs as follows:

- a. The space for the main charge is larger.
- b. The cover of the mine is screwed down with two screws.
- c. The cover is positioned by two wooden cleats instead of wooden pegs.
- d. The explosives total 12.5 pounds, as compared to 11.5 pounds in the wooden-box mine 42.
- e. The cover has a label marked *V.B.Mi. 1* and a description of the contents.

## 73. Antitank Schnellmine, Type A (Panzer Schnellmine, A)

*a. Description.* The antitank Schnellmine, type A (fig. 83) resembles a large Schümine in appearance and functioning. It has a wooden case 20¾ inches long, 12¼ inches wide, and 6¼ inches high in the armed position. The total weight of the mine is 20 pounds, including a main charge of 13 pounds of explosive and a 200-gram (0.44-pound) booster charge. A wooden fuze-holder block holds the fuze in position. A slot in the pressure lid clears the



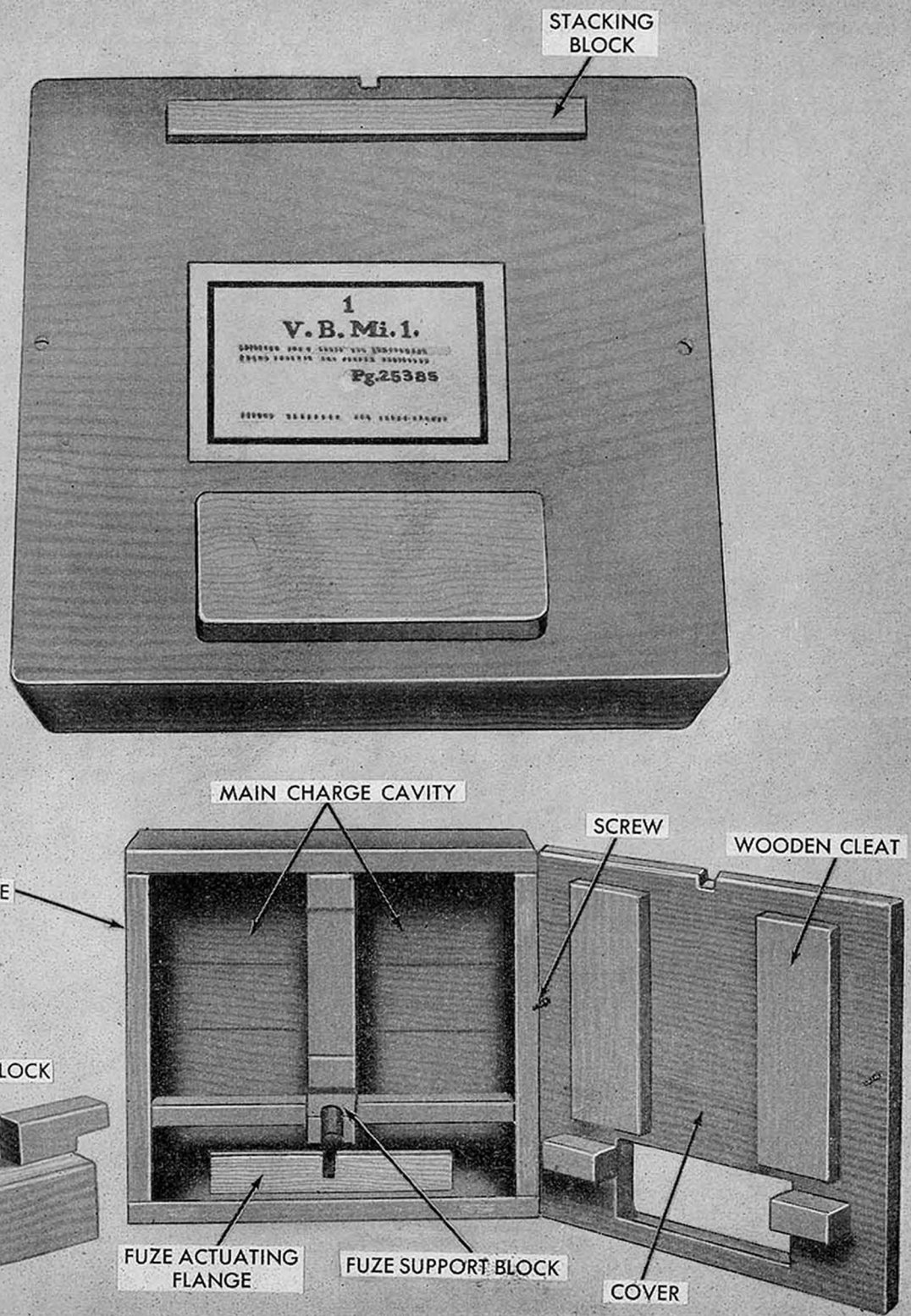


Figure 82. Wooden-box mine V.B.

striker shaft of the fuze, but not the wings of the striker-retaining pin. Two  $\frac{1}{2}$  inch wooden shear dowels support the pressure lid when in

the armed position. This mine uses the pull fuze 42 (par. 42). The mine is easily improvised.

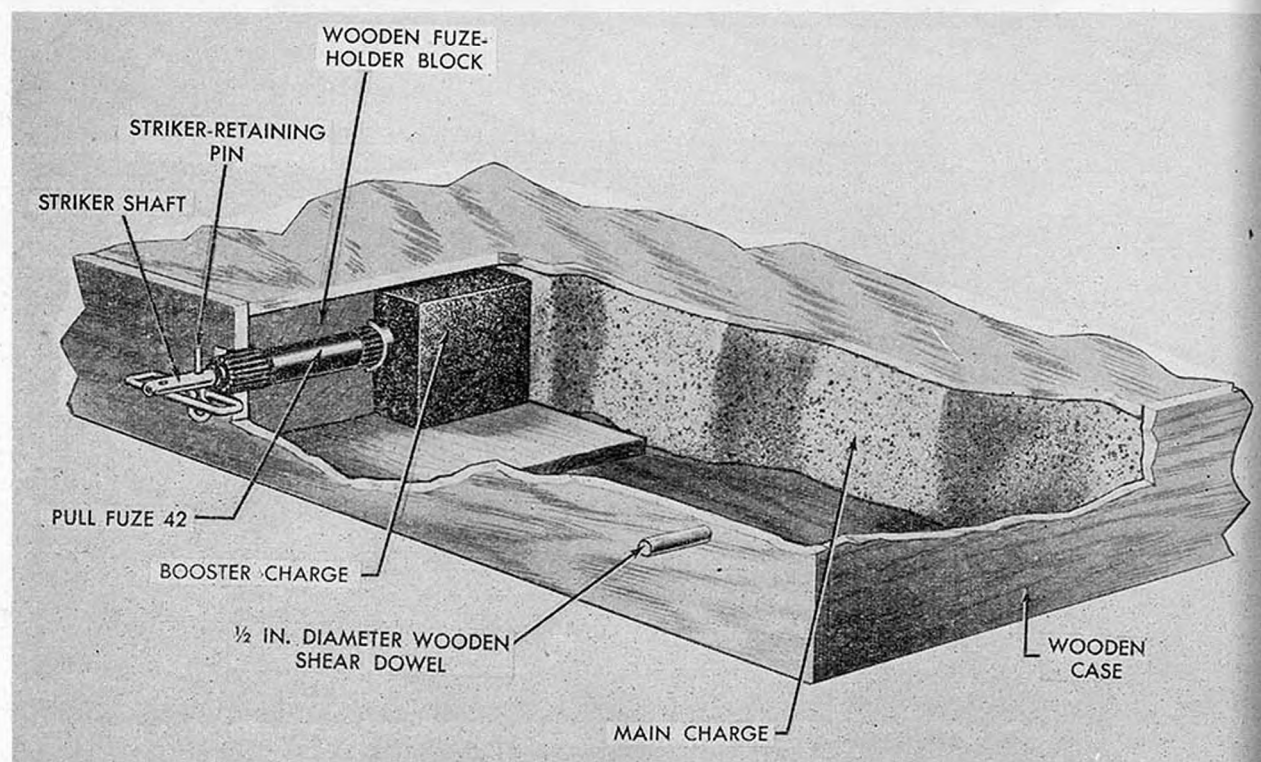
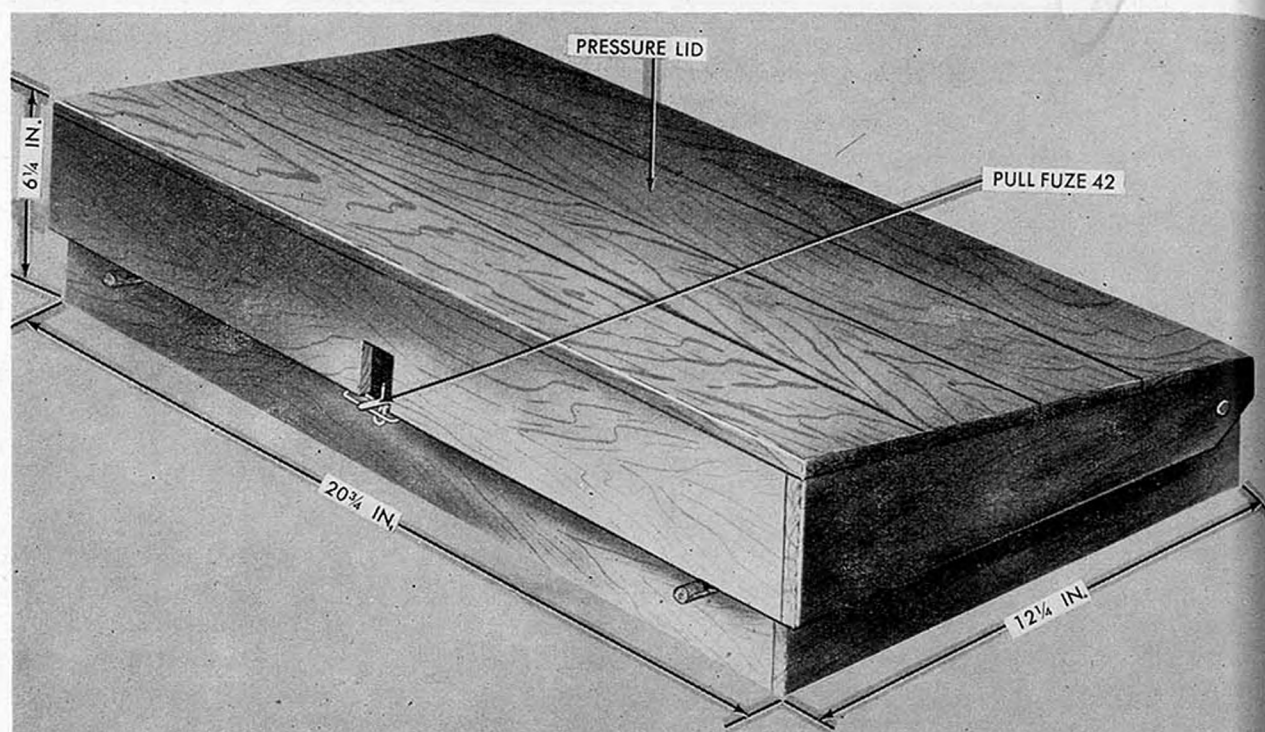


Figure 83. Antitank Schnellmine, type A.

b. *Employment.* This mine was designed for employment as an antitank mine. It is not used during periods of wet weather because it is not waterproof.

c. *Functioning.* A pressure of 100 pounds on the pressure lid shears the two wooden shear dowels and pushes the striker-retaining pin out of the striker shaft of the fuze, releasing the spring-loaded striker against the percussion cap and firing the mine.

d. *Installing and Arming.*

- (1) Raise the pressure lid of the mine and place the two wooden shear dowels in the holes provided.
- (2) Remove the wooden shipping plug from the booster charge, and screw a pull fuze 42, with detonator, into the booster charge through the holes in the wooden case and the wooden fuze-holder block.

*Note.* The wings of the striker-retaining pin should be horizontal and below the striker shaft.

- (3) Lower the pressure lid carefully on the wooden shear dowels and place the mine in the hole so the pressure lid is level with the ground surface.

*Note.* When laying more than one mine, keep 13-foot intervals between mines to reduce the possibility of sympathetic detonation.

e. *Neutralizing.*

- (1) Uncover the mine and make sure it is not damaged from either blast or deterioration.

**Caution:** Deterioration of the wood, over a period of time, makes this mine unsafe to handle. The wooden shear dowels must be in place and intact; otherwise, the mine will explode when the pressure lid is dropped.

- (2) Check for activating fuzes on the pressure lid, the side, and the bottom of the wooden case.
- (3) Lift the pressure lid of the mine.
- (4) Unscrew the pull fuze 42 and detonator from the booster charge.
- (5) Remove the detonator from the fuze.

f. *Packing.* The detonator and the fuze are carried separately from the mine. The fuze well is closed by a wooden plug to keep out dirt

before the mine is armed. The two wooden shear dowels are taped to the top of the wooden case.

## 74. Antitank Schnellmine, Type B (Panzer Schnellmine, B)

a. *Description.* The antitank Schnellmine, type B (fig. 84) is identical to the type A except for the fuze and the diameter of the shear dowels. This mine uses two Buck chemical fuzes (par. 28) which are screwed through the top of the case into booster charges near the center of the main charge. The pressure lid rests on two  $\frac{3}{4}$  inch wooden shear dowels, not on the fuzes.

b. *Employment.* This mine was designed for employment as an antitank mine. It is not used during periods of wet weather, because it is not waterproof.

c. *Functioning.* A pressure of 200 pounds on the pressure lid shears the two wooden shear dowels and crushes the Buck chemical fuzes, producing a flame which fires the detonators, the booster charges, and the main charge.

d. *Installing and Arming.*

- (1) Raise the pressure lid of the mine and place the two wooden shear dowels in the holes provided.
- (2) Remove the wooden plugs from the fuze wells.
- (3) Screw two Buck chemical fuzes, with detonators, through the top of the wooden case into the booster charges.

**Caution:** Grasp the Buck chemical fuze as near the base as possible to avoid crushing the fragile aluminum shell.

- (4) Lower the pressure lid carefully on the wooden shear dowels and place the mine in the hole so the pressure lid is level with the ground surface.

*Note.* When laying more than one mine, keep 13-foot intervals between mines to reduce the possibility of sympathetic detonation.

e. *Neutralizing.*

- (1) Uncover the mine and make sure it is not damaged from either blast or deterioration.



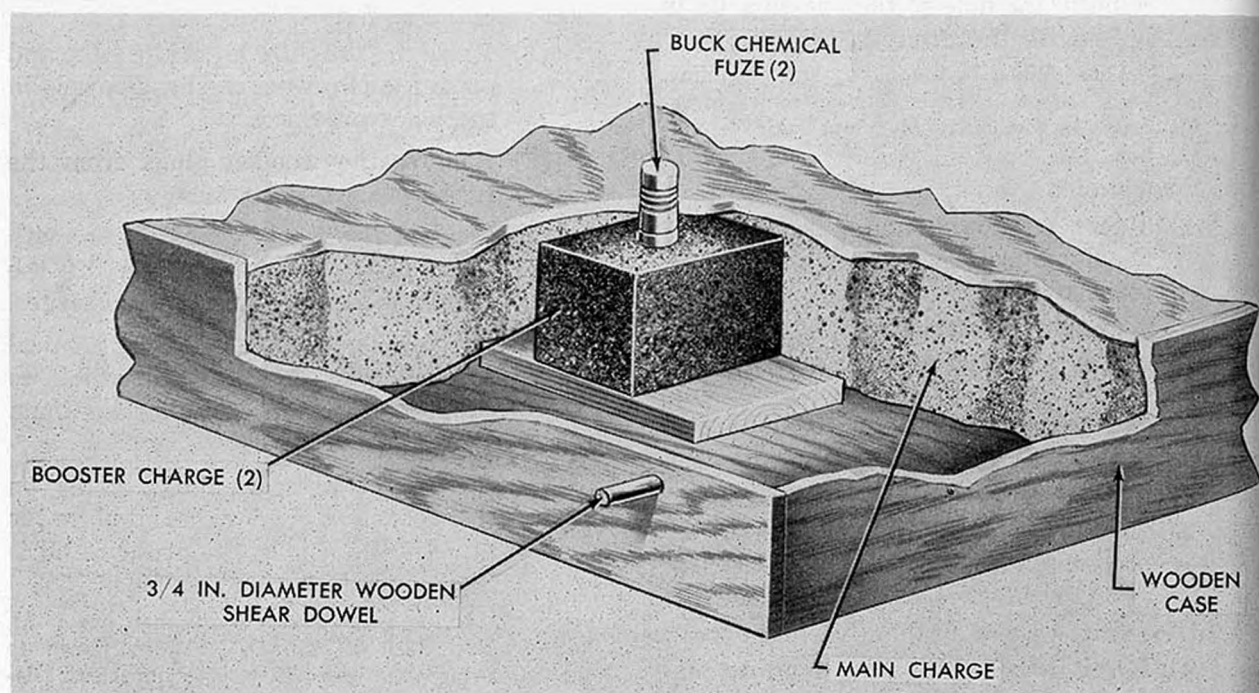
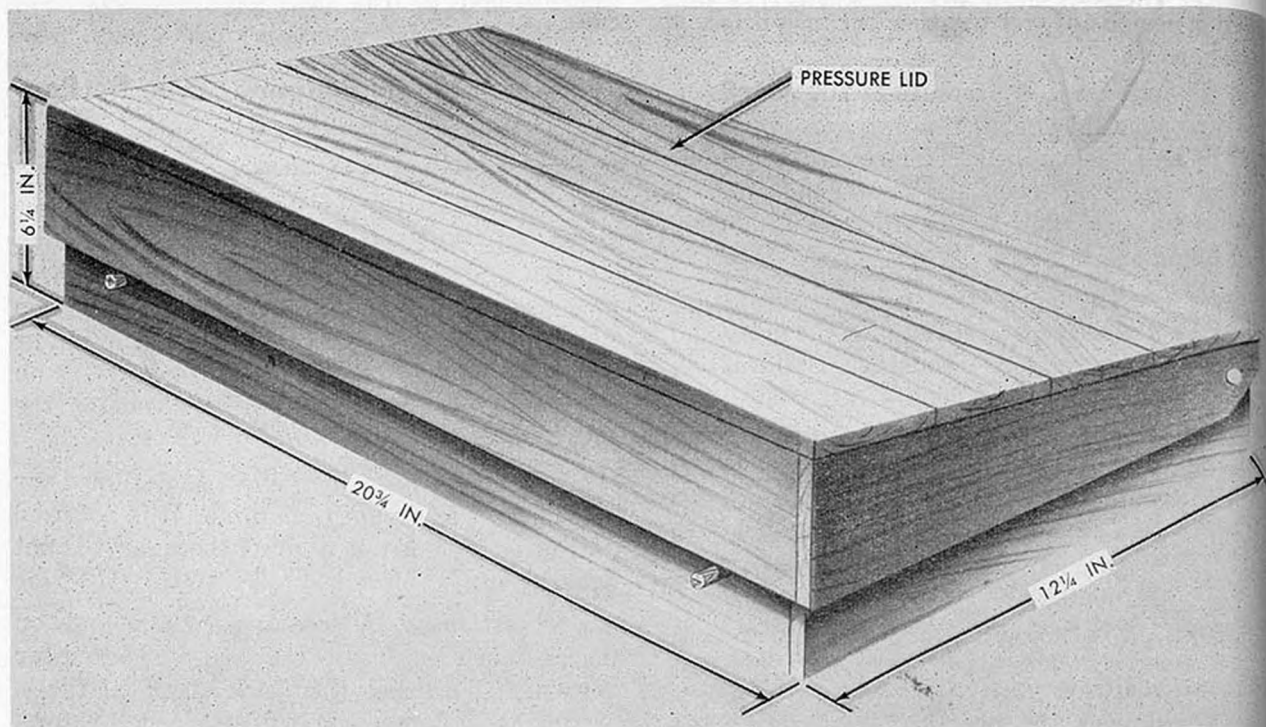


Figure 84. Antitank Schnellmine, type B.

**Caution:** Deterioration of the wood, over a period of time, makes this mine unsafe to handle. The wooden shear dowels must be in place and intact; otherwise, the mine will explode when the pressure lid is dropped.

- (2) Check for activating fuzes on the pressure lid, the side, and the bottom of the wooden case.
- (3) Lift the pressure lid of the mine.
- (4) Unscrew the Buck chemical fuzes and detonators from the booster charges.
- (5) Remove the detonators from the fuzes.

*f. Packing.* Mines are issued and carried individually. Detonators and fuzes are packed in separate boxes, 10 to a box, and carried separately. The fuze wells are closed by wooden plugs to keep out dirt before the mine is armed. The two wooden shear dowels are taped to the top of the wooden case.

## 75. Topfmines (To. Mi.)

*a. General.* The nonmetallic antitank Topfmine (pot mine) first appeared in combat in early 1945. It was produced to prevent detection by electronic mine detectors. The detonator had the only metal in the entire assembled mine although a cardboard detonator was often used.

### *b. Description.*

- (1) *Topfmine A.* The antitank Topfmine A (fig. 85) is 12½ inches in diameter and 5½ inches high. It weighs a total of about 21.25 pounds, including a main charge of about 13 pounds of explosive. The case is made of pressed wood pulp, cardboard, and tar. In some mines, the case is made of pressed bituminous coal waste, 1 inch thick. A thick, circular pressure plate is joined to the case at the shear groove. The Topfmine fuze SF 1 (par. 30), with the wooden fuze-and-booster-charge holder that connects it to the booster charge, is fitted into the mine through a hole in the bottom. This hole is closed with the large, circular glass fuze-assembly plug. The glass fuze-assembly plug contains an activating-fuze well, which is positioned slightly off center. A smaller,

hexagonal glass filler plug in the bottom of the mine closes the filler hole for the main charge. A cardboard handle is attached to the bottom of the mine by two glass cap screws. Either a snap fuze or a tilt fuze (fig. 86) can be used instead of the Topfmine fuze SF 1. The mine was designated the To. Mi. A4531 by the Germans, the letter A indicating that the mine was waterproofed. Mines not waterproofed were marked To. Mi. 4531.

- (2) *Topfmine B.* The Topfmine B (fig. 87) differs from type A only in that it is curved over the top, and that the shear groove of the pressure plate is inside the mine to prevent water from accumulating in the shear groove.
- (3) *Topfmine C (Pappmine).* The Topfmine C, or Pappmine (papermine), (fig. 88) has a flat top and bottom, and is provided with a fuze well in the top of the mine to receive the fuze. The fuze well is closed with a glass pressure plug.

*c. Employment.* These mines are employed as antitank mines. The Germans laid this mine with a black, metallic sandy substance called Tarnsand sprinkled on the mine; the mine was then covered with not more than 2 inches of dirt or soil. Tarnsand can be detected with the Stuttgart 43 detector (par. 133) if it is desired to retake the mine field. In areas being abandoned, Tarnsand is not used.

*Note.* The SCR-625 detector will not detect this mine.

### *d. Functioning.*

- (1) *With the Topfmine fuze SF 1.* A pressure of at least 330 pounds on the pressure plate shears off the pressure plate at the shear groove and transfers the pressure to the glass pressure head of the fuze. (The Topfmine C, or Pappmine, has a thin cardboard pressure plate with a glass pressure plug in the center instead of a thick pressure plate with a shear groove). The pressure on the glass pressure head shears off the glass rim of the pressure head at the shear groove, allowing the pressure head to crush the

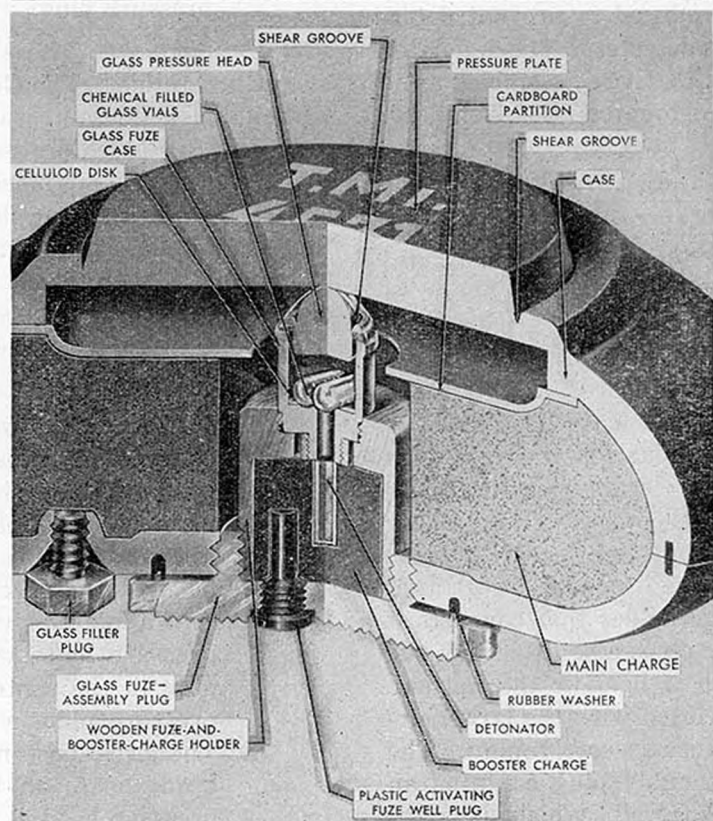
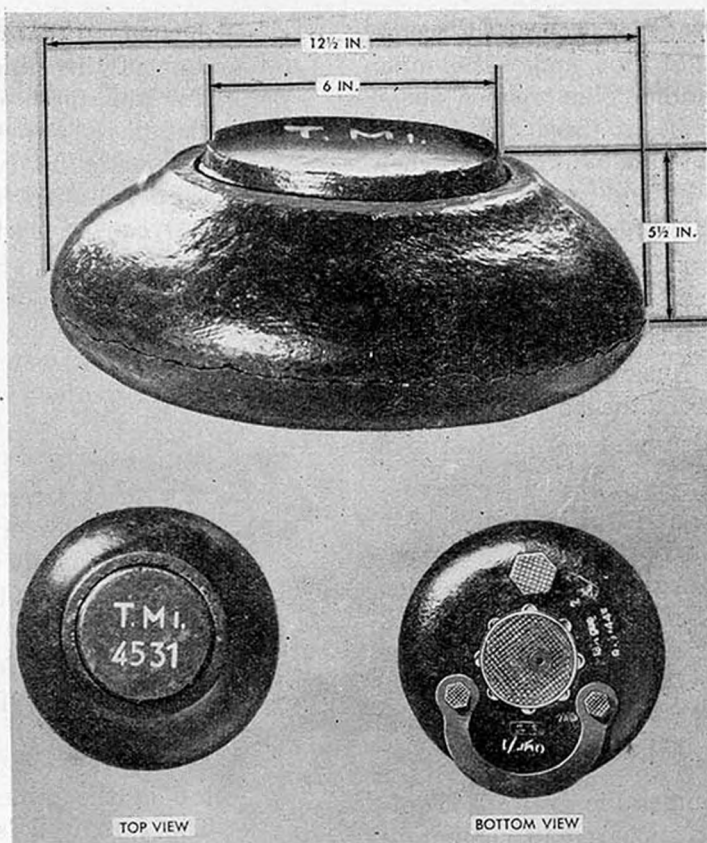


Figure 85. Topfmine A.



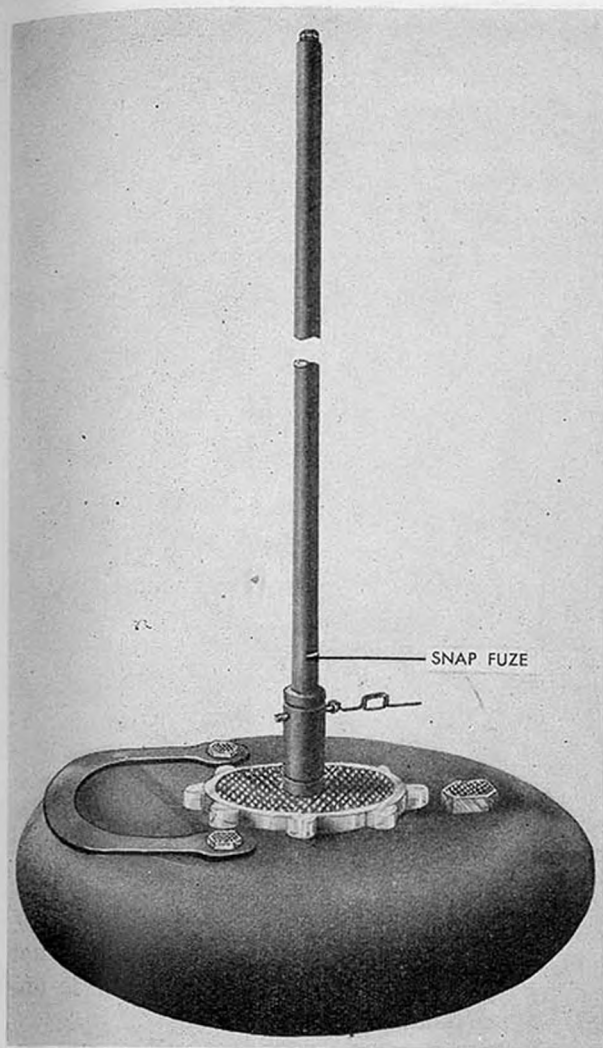


Figure 86. Topmine A fitted with a snap fuze.

two glass vials of chemicals. The chemicals react to cause a flame which sets off the detonator, the booster charge, and the main charge.

- (2) *With a snap fuze or a tilt fuze.* A sideward pressure exerted on the fuze actuates it and fires the mine.

*e. Installing and Arming Topmines A and B.*

- (1) *With the Topmine fuze SF 1.*
  - (a) Unscrew the glass fuze-assembly plug from the mine.
  - (b) Screw the fuze, with detonator, into the wooden fuze-and-booster-charge holder.
  - (c) Firmly screw the glass fuze-assembly plug into the bottom of the mine

case, making sure that the rubber washer and its groove in the mine case are perfectly clean.

- (d) Lay the mine in a hole with the pressure plate up. Do not use more than a 2-inch camouflage layer over the pressure plate. Keep a distance of 7 feet between mines to reduce the possibility of sympathetic detonation.

(2) *With a snap fuze or a tilt fuze.*

- (a) Turn the mine upside-down and place it in the hole.
- (b) Remove the plastic activating fuze well plug and screw a snap fuze or a tilt fuze, with detonator, into the activating fuze well in the glass fuze-assembly plug.
- (c) Arm the fuze in accordance with instructions outlined in chapter 5.

*f. Installing and Arming Topmine C.*

(1) *With the Topmine fuze SF 1.*

- (a) Unscrew the glass pressure plug from the mine.
- (b) Screw the fuze, with detonator, into the booster charge.
- (c) Firmly screw the glass pressure plug into the mine case.
- (d) Lay the mine in a hole with the glass pressure plug up. Do not use more than a 2-inch camouflage layer over the glass pressure plug. Keep a distance of 7 feet between mines to reduce the possibility of sympathetic detonation.

(2) *With a snap fuze or a tilt fuze.*

- (a) Unscrew the glass pressure plug from the mine.
- (b) Screw a snap fuze or a tilt fuze, with detonator, into the booster charge.
- (c) Arm the fuze in accordance with instructions outlined in chapter 5.

*g. Neutralizing Topmines A and B.*

(1) *Pressure plate up.*

- (a) Uncover the mine and make sure that the pressure plate is not depressed and that the mine is undamaged, especially along the shear groove of the pressure plate.

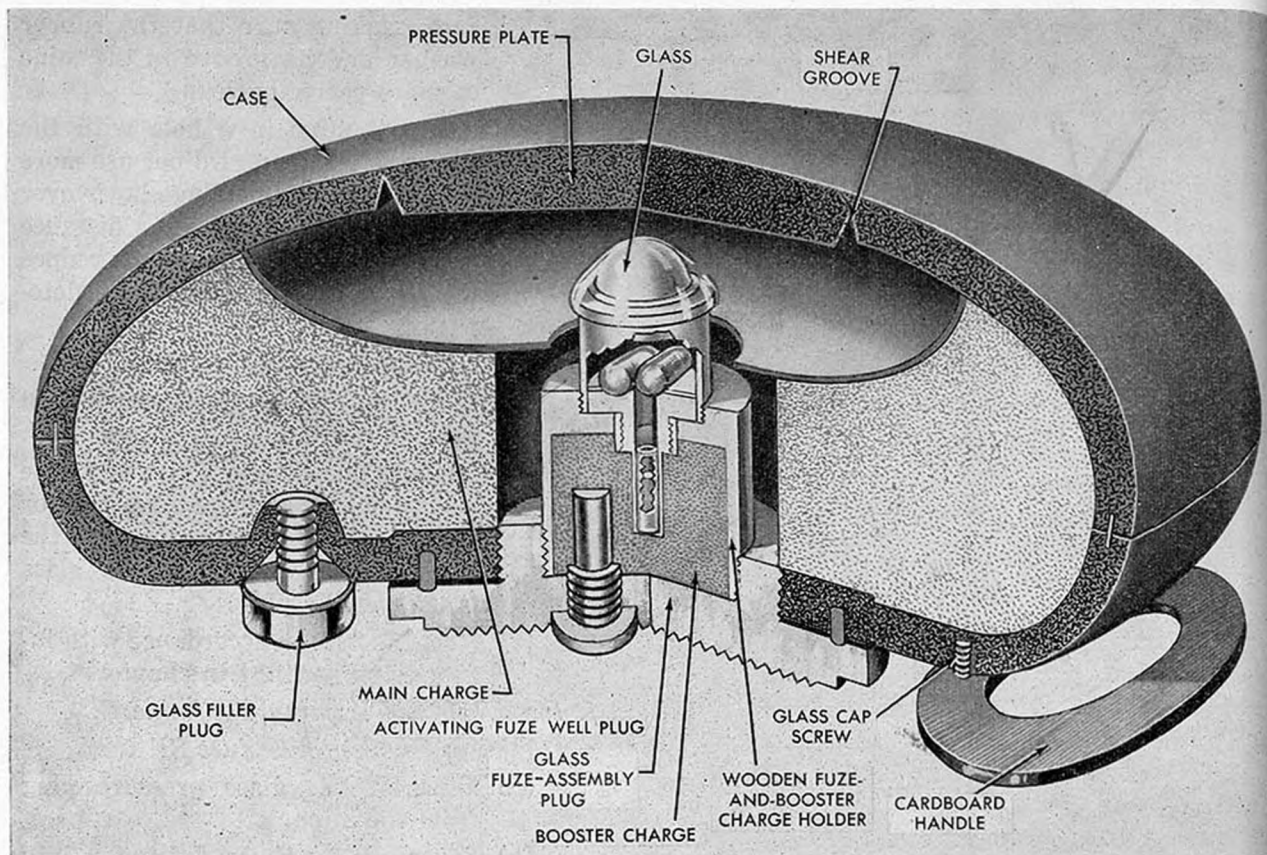


Figure 87. Topmine B.

- (b) Check for and neutralize any activating fuzes.
- (c) Lift the mine carefully, rest it on one side, and unscrew the glass fuze-assembly plug.
- (d) Unscrew the Topmine fuze SF 1 from the wooden fuze-and-booster-charge holder.
- (e) Unscrew the detonator from the fuze.

(2) *Pressure plate down.*

- (a) Carefully uncover the mine and fuze.
- (b) Cut any slack trip wires attached to the extension rod or tilt rod of the fuze.
- (c) Neutralize the fuze in accordance with the instructions outlined in chapter 5.

*h. Neutralizing Topmine C.*

(1) *With the Topmine fuze SF 1.*

- (a) Uncover the mine and make sure

that the glass pressure plug is not depressed and that the mine is undamaged.

- (b) Check for and neutralize any activating fuzes.
- (c) Unscrew the glass pressure plug from the mine.
- (d) Unscrew the fuze from the booster charge.
- (e) Unscrew the detonator from the fuze.

(2) *With a snap fuze or a tilt fuze.*

- (a) Carefully uncover the mine and fuze.
- (b) Cut any slack trip wires attached to the extension rod or tilt rod of the fuze.
- (c) Check for and neutralize any activating fuzes.
- (d) Neutralize the fuze in accordance with the instructions outlined in chapter 5.

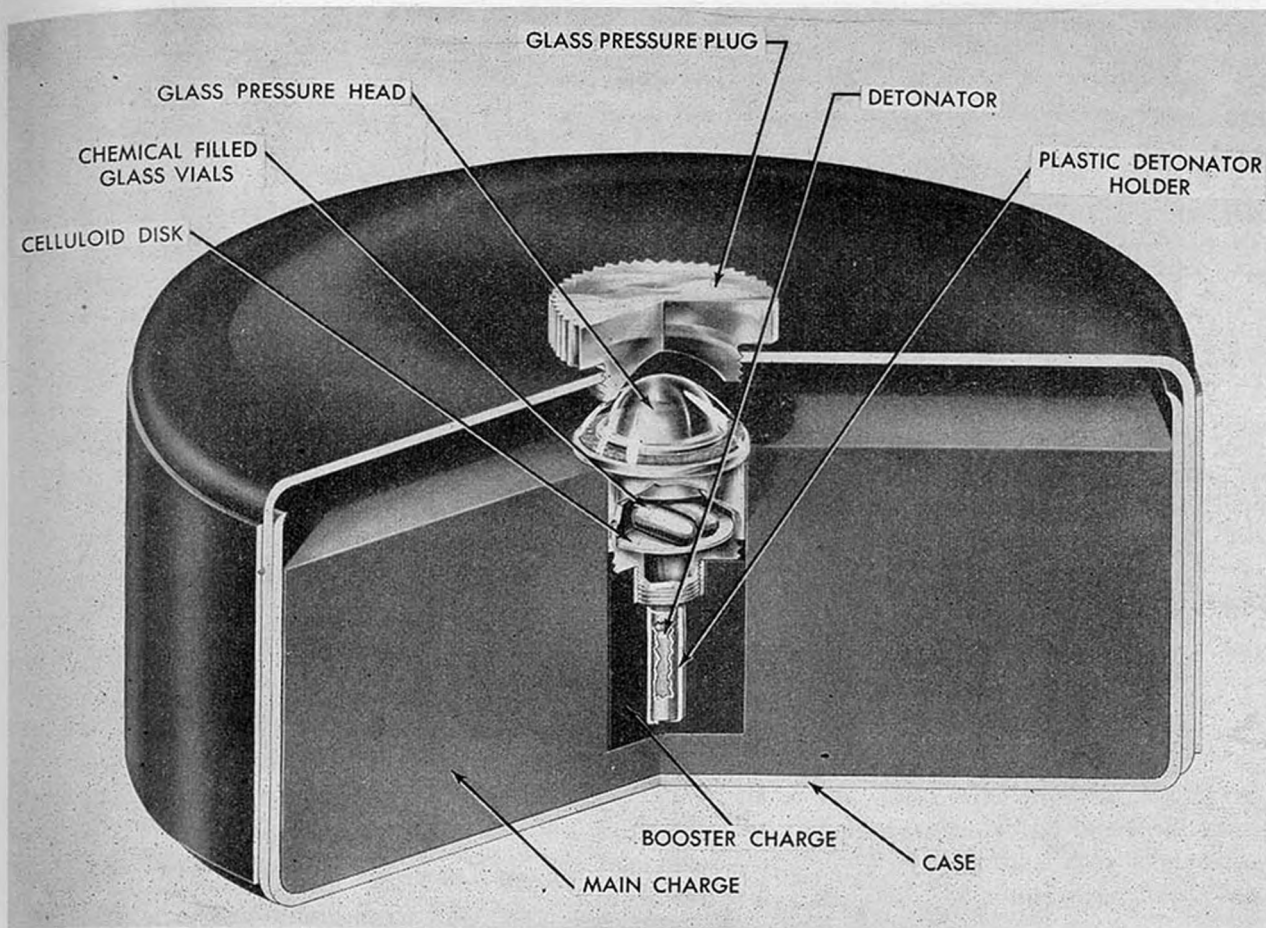


Figure 88. Topfmine C (Pappmine).

#### i. Packing.

- (1) The mines are individually packed in open wooden crates, marked *To.Mi. 4531* or *To.Mi. A4531*.
- (2) Topfmine fuzes SF 1 are packed separately in wooden cases containing five fuses. These cases are marked *To.Mi.Z. #FGI*.
- (3) Nonmetallic detonators are packed separately in small wooden cases containing 15 detonators.
- (4) Armed Topfmines must not be shipped. Neutralized mines may be shipped without being crated, but they must not be stacked.
- (5) Topfmine fuzes SF 1 must be shipped only in their wooden cases.

## 76. Antitank Clay Mine

a. *Description.* The antitank clay mine (fig.

89) consists of a baked-clay case, 8½ inches in diameter and 10 inches high, which resembles an urn. On opposite sides of the cases are two round bulges which house pull fuzes 42 (par. 42). The detonators in the fuzes are connected by detonating cord, through detonating-cord cavities, to booster charges in the bottom of the case. A clay pressure lid covers the top of the case. On opposite sides of the pressure lid are two notches which clear the striker shafts of the fuzes but not the wings of the striker-retaining pins.

b. *Employment.* This mine is used in areas being abandoned to opposing forces, since its clay construction prevents detection by electrical detectors.

c. *Functioning.* Pressure on the clay pressure lid shears the lip of the pressure lid, drops the lid, and pushes out the striker-retaining pins of the pull fuzes 42, releasing the spring-



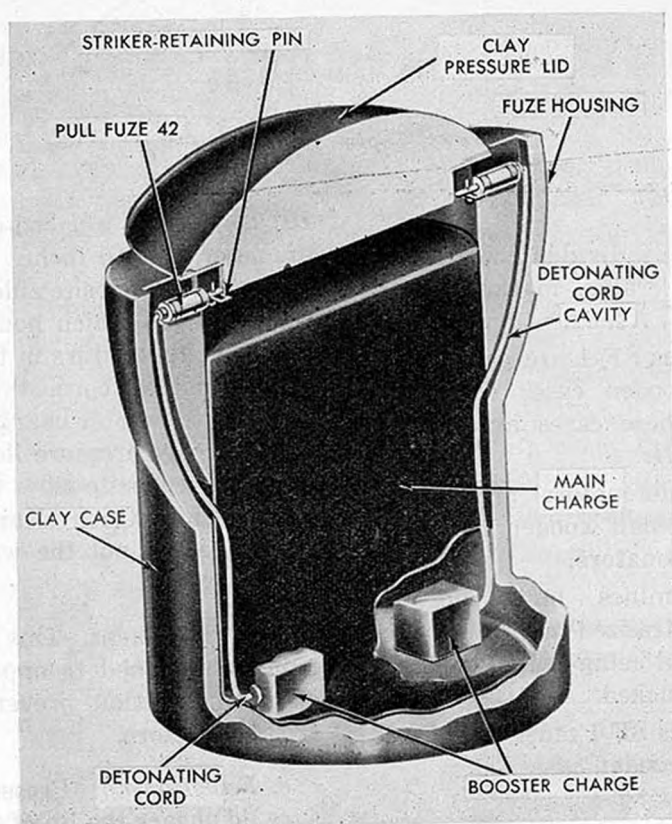
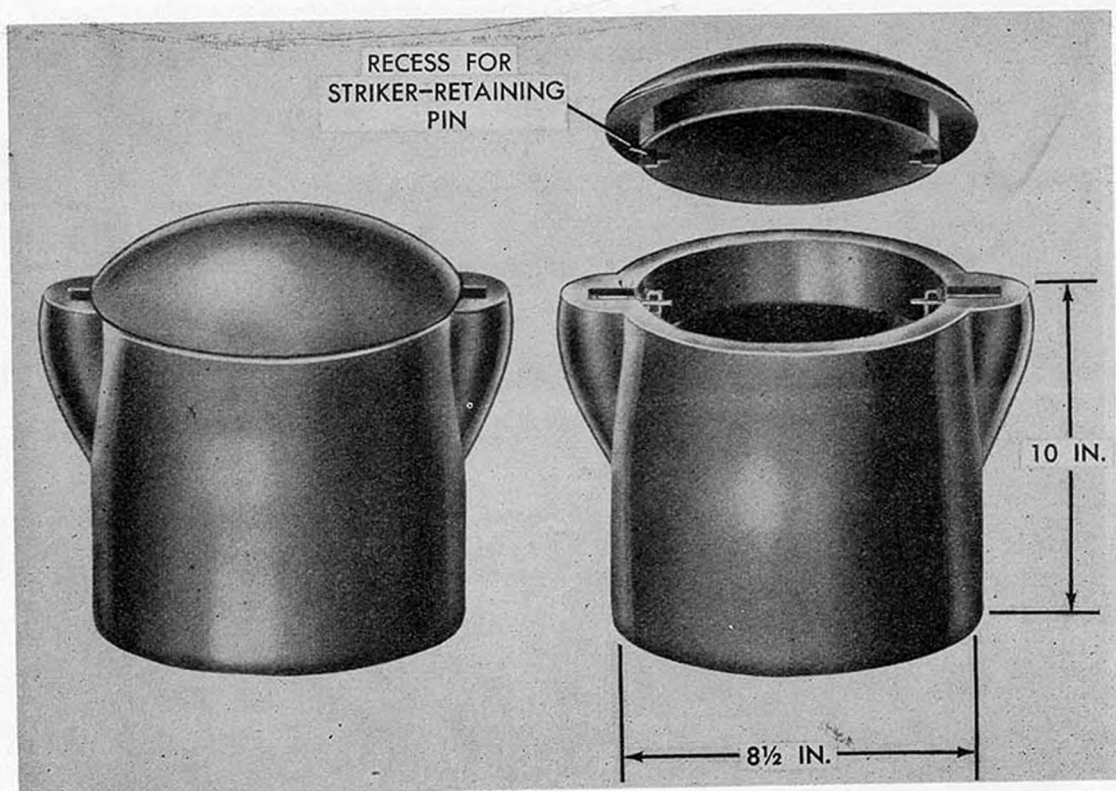


Figure 89. Antitank clay mine.

loaded strikers against the percussion caps and firing the mine.

*d. Installing and Arming.*

- (1) Remove the clay pressure lid.
- (2) Thread detonating cord through the detonating-cord cavities and connect each of the two lengths of detonating cord to a booster charge in the bottom of the clay case by inserting the cord in a hole punched in the side of the booster charge.
- (3) Connect the other end of each length of detonating cord to the detonator of the pull fuze 42.
- (4) Insert the main charge in the clay case.
- (5) Install the two pull fuzes 42 so the wings of the striker-retaining pins are

horizontal and below the striker shafts.

- (6) Replace the pressure lid so the notches line up with the fuzes, and place the mine in a hole so the pressure lid is level with the ground surface. Keep a distance of 9 feet between mines to reduce the possibility of sympathetic detonation.

*e. Neutralizing.*

- (1) Check for and neutralize any activating fuzes.
- (2) Uncover the mine and lift off the pressure lid.
- (3) Examine the striker-retaining pins to see that they extend all the way through the striker shafts.
- (4) Cut the detonating cords near the fuzes, and remove the fuzes.

## Section II. IMPROVISED ANTITANK MINES

### 77. General

The German Army seldom used improvised antitank mines. In most cases, the supply of standard antitank mines was adequate. The occasional employment of improvised antitank mines was brought about by a local shortage of standard mines or by the availability of suitable material for improvising mine cases in certain areas. Even in improvisation, the Germans were meticulous in the assembly of the mines. Paragraphs 78 through 82 describe the most commonly encountered improvised antitank mines.

### 78. Aluminum Mine

*a. Description.* The improvised antitank aluminum mine (fig. 90) consists of an aluminum pressure lid  $12\frac{1}{2}$  inches in diameter, an aluminum disk, and an aluminum case  $11\frac{5}{8}$  inches in diameter that contains the main charge and three booster charges. The aluminum disk fits over the main charge and has three main fuze wells, which are located over the three booster charges. The mine is fuzed with three pressure fuzes 35 (par. 24). The aluminum pressure lid fits over the aluminum case and rests on top of the fuzes. Three slots

are cut in the side of the pressure lid for extracting the safety pins of the fuzes. The mine is  $4\frac{3}{4}$  inches high with the fuzes in place and has a total weight of 12 pounds, including 7 to 9 pounds of explosive.

*b. Employment.* This mine is used for local security of airfields and nearby installations. It may also be used in mine fields.

*c. Functioning.* Pressure of 150 pounds, or more, depresses the pressure lid, actuating one, or more, of the three pressure fuzes and firing the mine.

*d. Installing and Arming.*

- (1) Remove the aluminum pressure lid.
- (2) Screw three pressure fuzes 35, with detonators, into the main fuze wells in the aluminum disk. The booster charges should be directly under the fuze wells. Make sure the pressure caps of the fuzes are adjusted to the same height.
- (3) Replace the pressure lid and place the mine in a hole so the pressure lid is level with the ground surface.
- (4) Remove the safety pins from the fuzes by pulling on the attached cords, through the slots in the pressure lid.

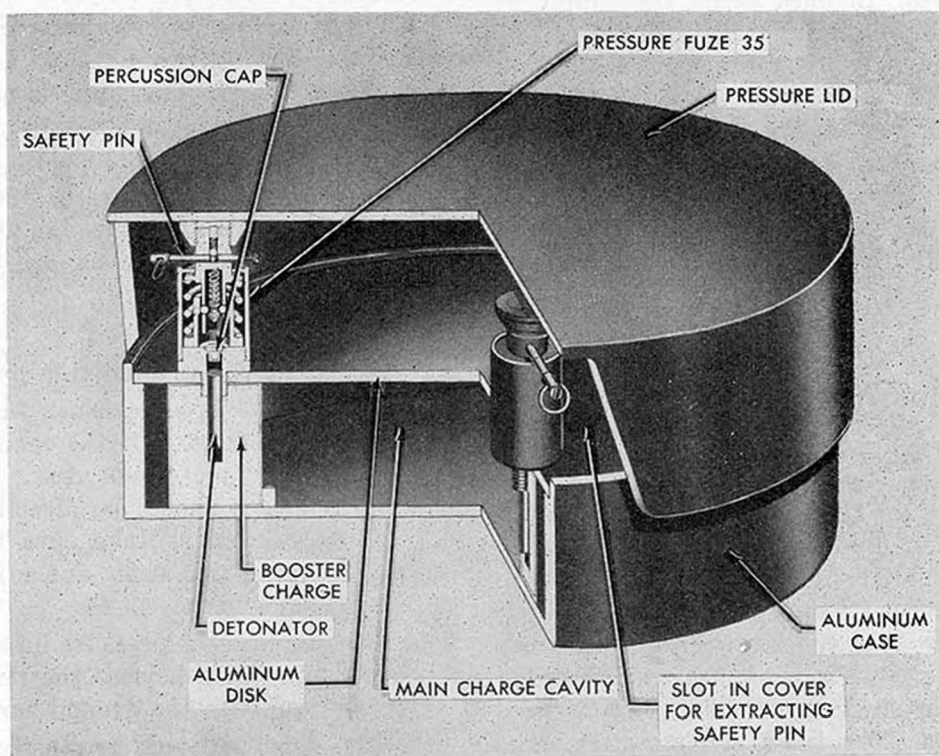
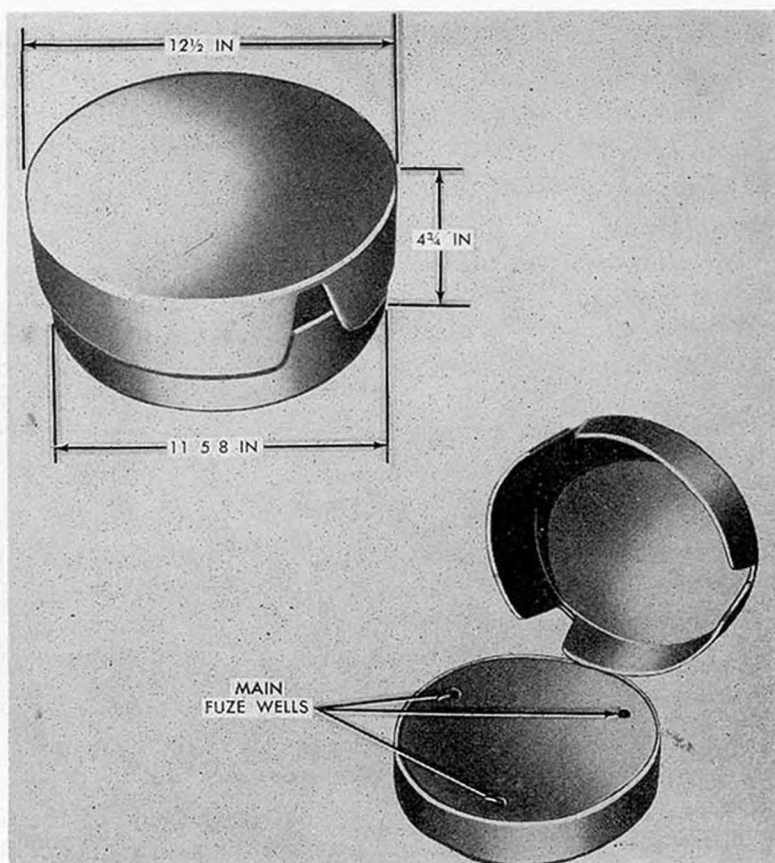


Figure 90. Improved antitank aluminum mine.



*e. Neutralizing.*

- (1) Remove the pressure lid.
- (2) Insert nails or wires in the safety-pin holes of the fuzes.
- (3) Unscrew the fuzes from the fuze wells.
- (4) Remove the detonators from the fuzes.
- (5) Lift the mine.

## 79. Wooden-Box Mines

*a. Description.* Improvised antitank wooden-box mines vary greatly in size, amount of explosive, and type of construction. The amount of explosive varies from 7 to 20 pounds. The fuzes and the prepared charges employed depend on the mission the mine is to perform. The two mines shown in figure 91 are typical improvised wooden-box mines. The main fuze is of the pressure type (usually a pressure fuze 35, par. 24) and is screwed into a prepared charge. The prepared charge acts as the booster charge. The main charge is made up of enough explosive to accomplish the mission. If activating is desired, a pull fuze may be screwed into a prepared charge and connected by a pull wire to the mine case, the pressure lid, or a small dead man.

*b. Employment.* These mines are used in road blocks and may be used as booby traps.

*c. Functioning.*

- (1) Pressure of about 150 pounds on the pressure lid actuates the pressure fuze, releasing the spring-loaded striker against the percussion cap and firing the prepared charge.
- (2) The prepared charge, acting as the booster charge, fires the main charge.

*d. Installing and Arming.*

- (1) Place the wooden mine case, with the main charge and one or more prepared charges, into a hole.
- (2) If activating is desired, screw a pull fuze, with detonator, into a prepared charge, and anchor the pull wire so the fuze will be actuated when the mine is lifted. If feasible, attach the pull wire of the activating pull fuze to the pressure lid of the mine.

- (3) Screw a pressure fuze, with detonator, into a prepared charge.
- (4) Remove the safety pins from the fuzes.
- (5) Cover the mine with from 5 to 6 inches of earth.

*e. Neutralizing.*

- (1) Investigate the mine for activating fuzes, and neutralize any that are found. If a pull fuze is attached to the pressure lid of the mine, cut the slack pull wire and remove the pressure lid; or, from a covered position, pull off the pressure lid with a 50-yard rope or wire.
- (2) Insert a safety pin in the safety-pin hole of the pressure fuze.
- (3) Unscrew the pressure fuze and detonator from the prepared charge.
- (4) Remove the detonator from the fuze.

## 80. Ramp Mine

*a. Description.* The improvised antitank ramp mine (fig. 92) consists of charges fitted with pressure fuzes 35 (par. 24) and laid under a sloping board, or ramp, at railroad crossings, bridge approaches, and similar sites.

*b. Employment.* This mine is installed at railroad crossings and bridge approaches, disguised as a ramp to assist vehicles in crossing.

*c. Functioning.* Pressure on the sloping board or ramp actuates the pressure fuzes, releasing the spring-loaded strikers against the percussion caps and firing the charges.

*d. Installing and Arming.* Hinge together two boards at least 10 inches wide and 6 feet long and lay them with the hinged side toward the enemy. Install the charges with pressure fuzes 35, one about every 3 feet, on the lower board, along the open edge of the ramp. Remove the safety pins from the fuzes, and carefully lower the top board onto the fuzes.

*e. Neutralizing.*

- (1) Examine the mine for activating fuzes and neutralize any that are found.
- (2) Lift the top board.
- (3) Insert safety pins or nails in the safety-pin holes of the pressure fuzes.

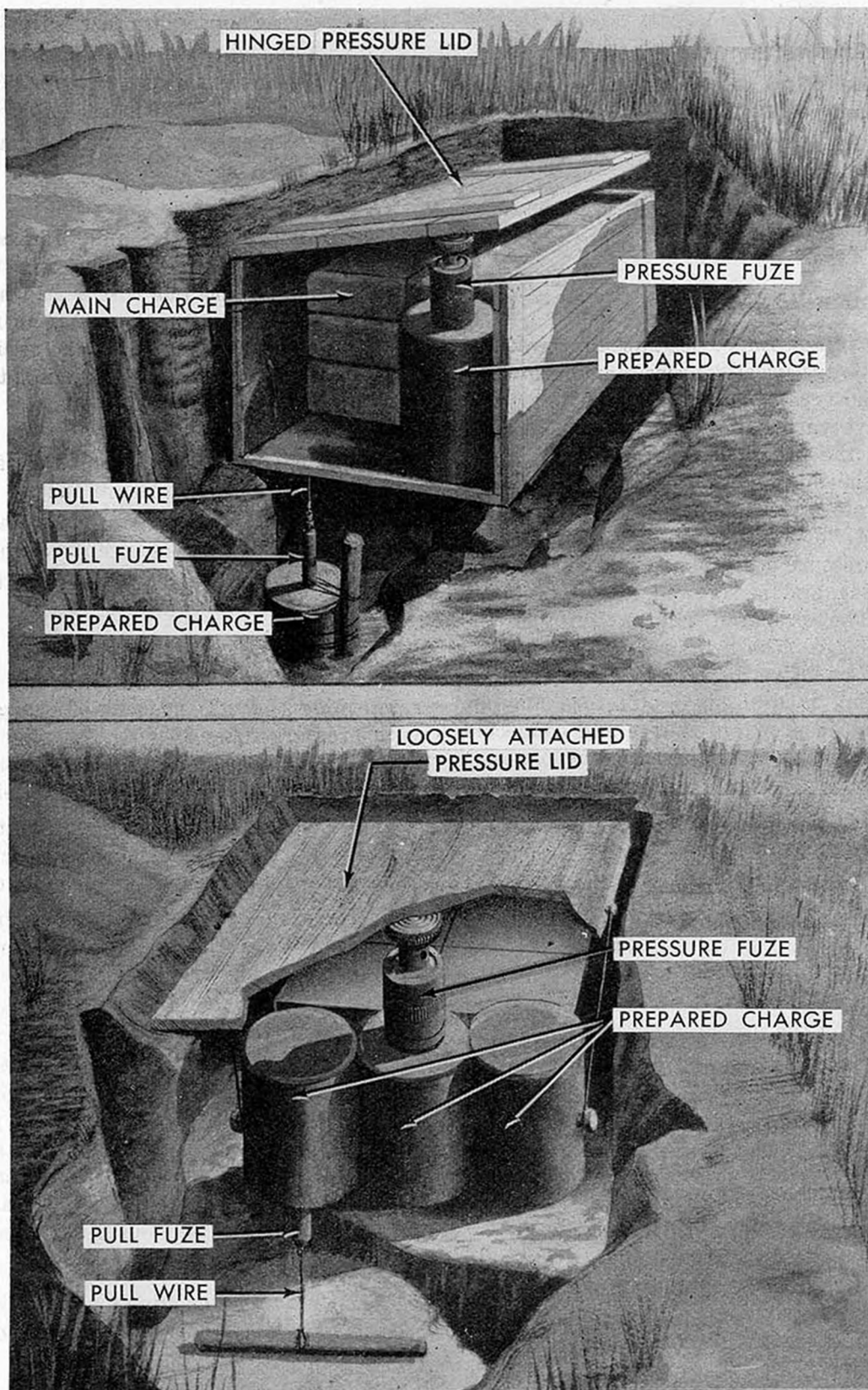


Figure 91. Typical improvised antitank wooden-box mines.

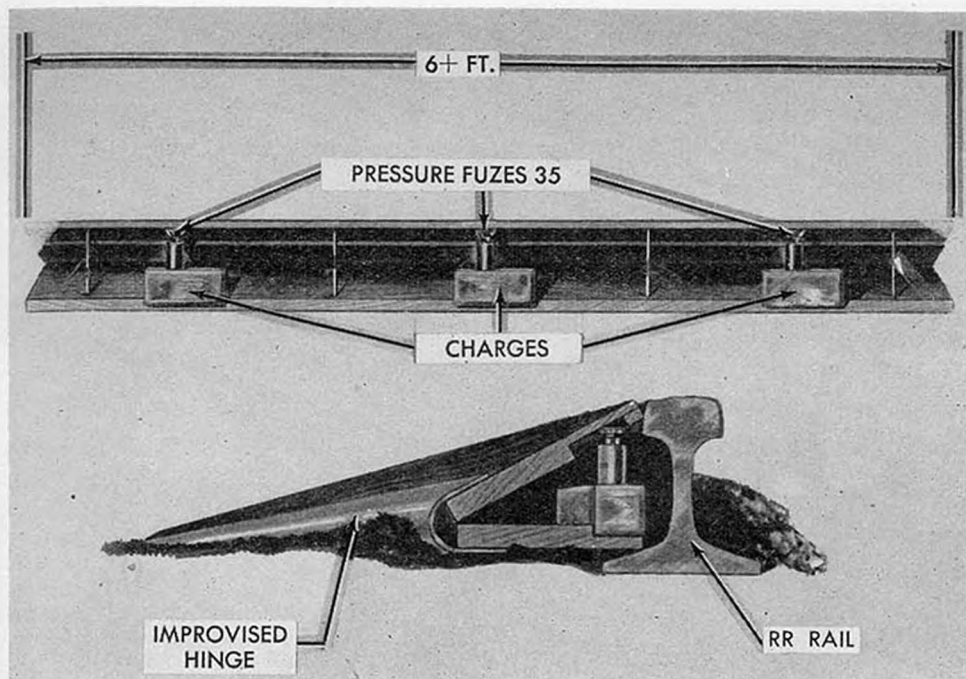


Figure 92. Improved antitank ramp mine.

- (4) Unscrew the pressure fuzes and detonators from the charges.
- (5) Remove the detonators from the fuzes.
- (6) Remove the charges from the mine.

## 81. Shell Mines (Geschossminen)

*a. Description.* The improvised antitank shell mine (fig. 93) consists of a large-caliber artillery shell set in a wooden frame. A pull fuze 42 (par. 42) is screwed into the head of the shell. The fuze case rests on the fuze-support block. The fuze-actuating block is fastened at right angles to the free end of the hinged pressure board. The fuze-actuating block has a slot that clears the striker shaft of the fuze but not the wings of the striker-retaining pin. The fuze-actuating block rests on two wooden dowels or nails projecting out of the fuze-support block.

*b. Employment.* This mine is employed as an antitank beach mine with captured shells being used as the charges. It can also be used in road blocks and in mine fields; smaller shells, such as mortar shells, can be used as improvised anti-personnel mines.

*c. Functioning.* Pressure on the pressure board shears the two wooden dowels or bends

over the two nails projecting out of the fuze-support block and pushes the striker-retaining pin out of the fuze, releasing the spring-loaded striker against the percussion cap and firing the shell.

### *d. Installing and Arming.*

- (1) Adapt the shell head to receive the fuze and place the shell in the wooden frame.
- (2) Screw the pull fuze 42, with detonator, into the shell. The wings of the striker-retaining pin should be horizontal and below the striker shaft.
- (3) Lower the pressure board until the fuze-actuating block rests on the wooden dowels or nails projecting out of the fuze-support block.

### *e. Neutralizing.*

- (1) Check for and neutralize any activating fuzes.
- (2) Make sure the striker-retaining pin of the pull fuze 42 extends entirely through the striker shaft.
- (3) Lift the pressure board.
- (4) Unscrew the fuze and detonator from the shell.
- (5) Remove the detonator from the fuze.



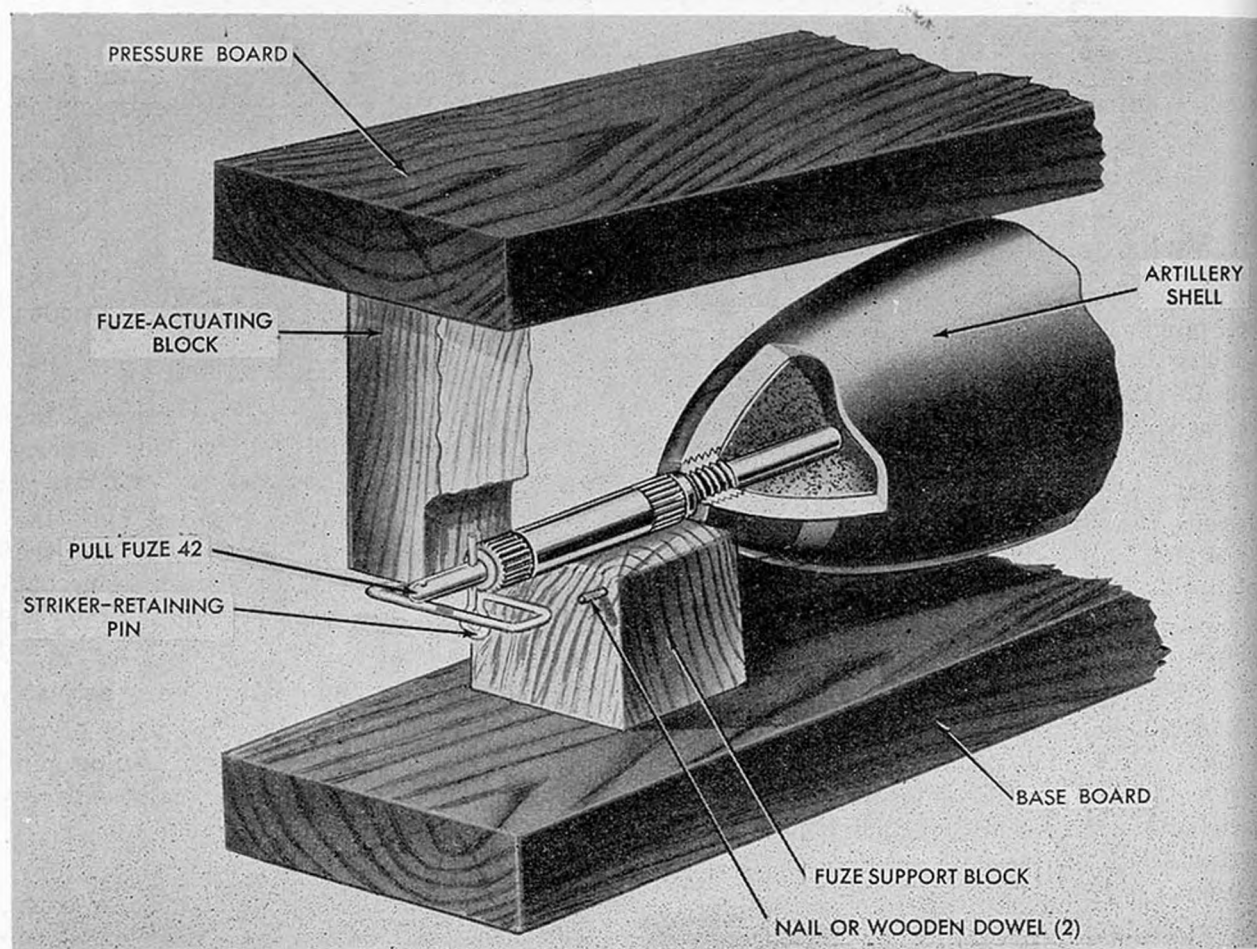
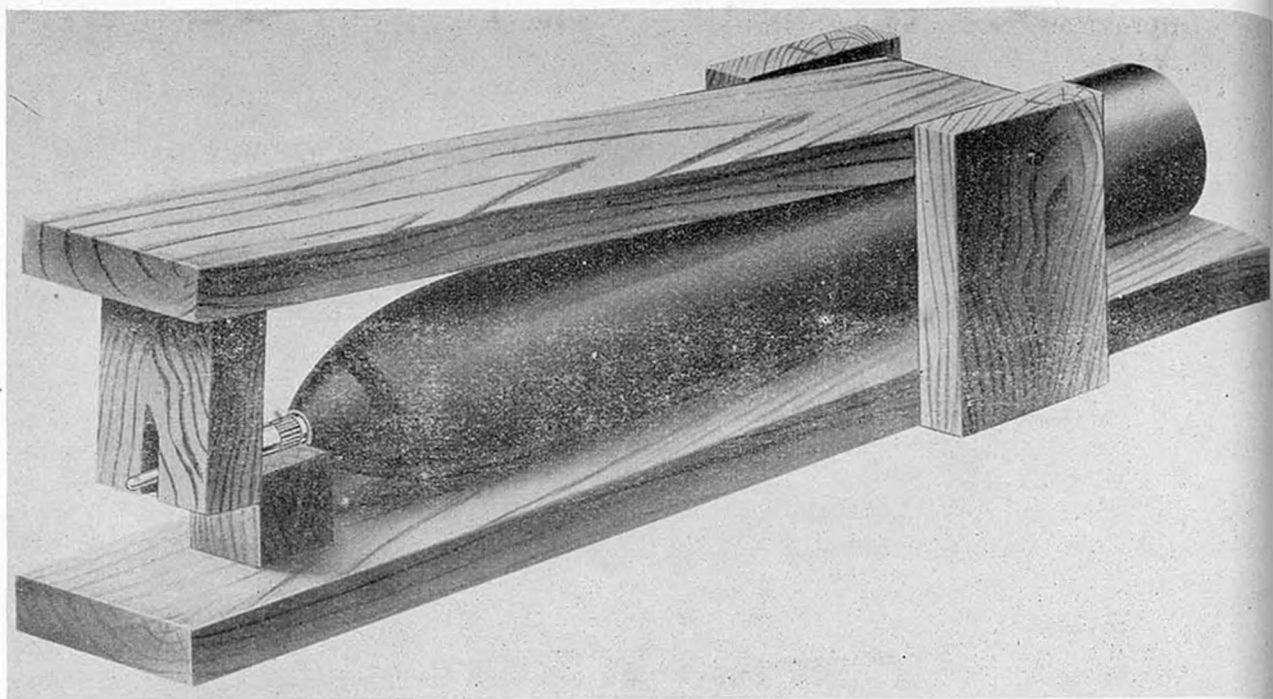


Figure 93. Improvised antitank shell mine.

## 82. Improved Panzerfaust Antitank Mine

a. *Description.* The Panzerfaust is a recoilless weapon, similar to United States rocket launchers, and was often improvised as an anti-tank mine. The Panzerfaust gross 30 m. (fig. 94), weighing 11.5 pounds, was the most widely used model. It consists of a launching tube, projectile, propelling charge, a firing mechanism, and a folding sight. It is a single-shot weapon since it cannot be reloaded. During transit, the folding sight is folded down flush with the launching tube, and the folding sight and the projectile are secured to the launching tube by a retaining pin. The launching tube is about 2 inches in diameter and 31½ inches long.

The projectile (fig. 95) is 19½ inches long and weighs 6.75 pounds. This projectile is capable of penetrating 8 inches of armor. It consists of a 3.5-pound hollow charge with a steel, cone-shaped liner, a spacer head, a booster charge, an impact fuze, and two spring-steel stabilizing fins. The spacer head is attached to the front of the hollow charge and provides the correct stand-off. In the tail of the hollow charge is a fuze well that houses the booster charge and the impact fuze. Attached to the tail of the hollow charge is a wooden fin support with the two spring-steel stabilizing fins. Directly behind the fin support is the propelling charge, which weighs about 3 ounces. The firing mechanism is enclosed in a cylindrical case on the top of the launching tube. It consists of a spring-

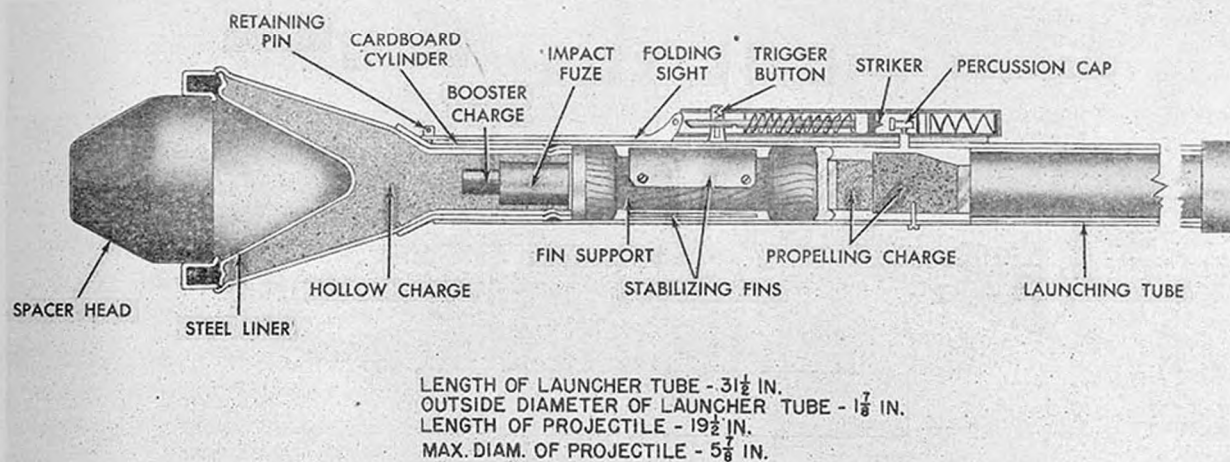


Figure 94. Panzerfaust gross 30 m.

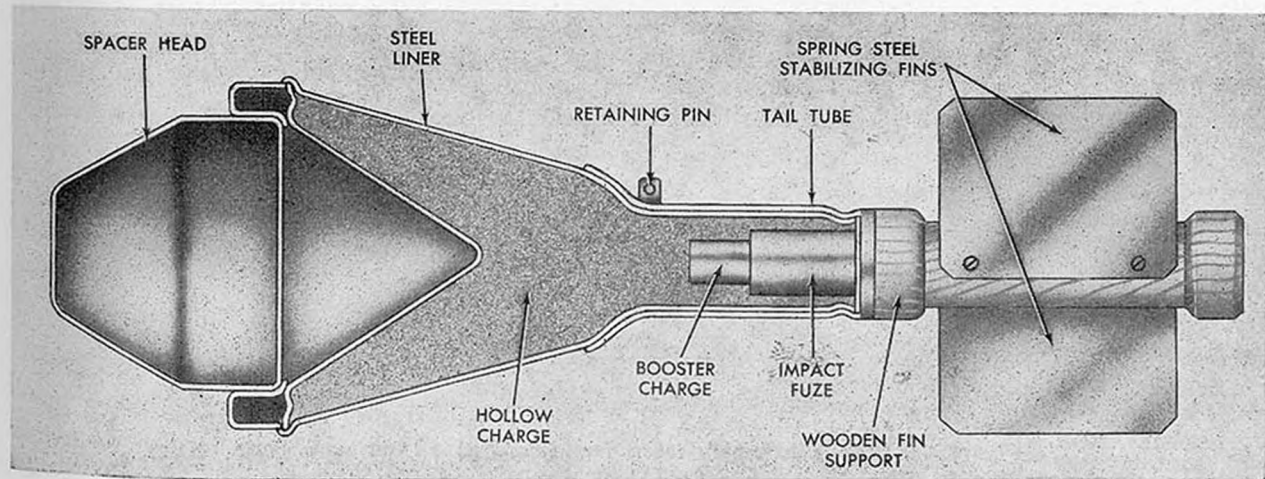


Figure 95. Projectile of Panzerfaust gross 30 m.

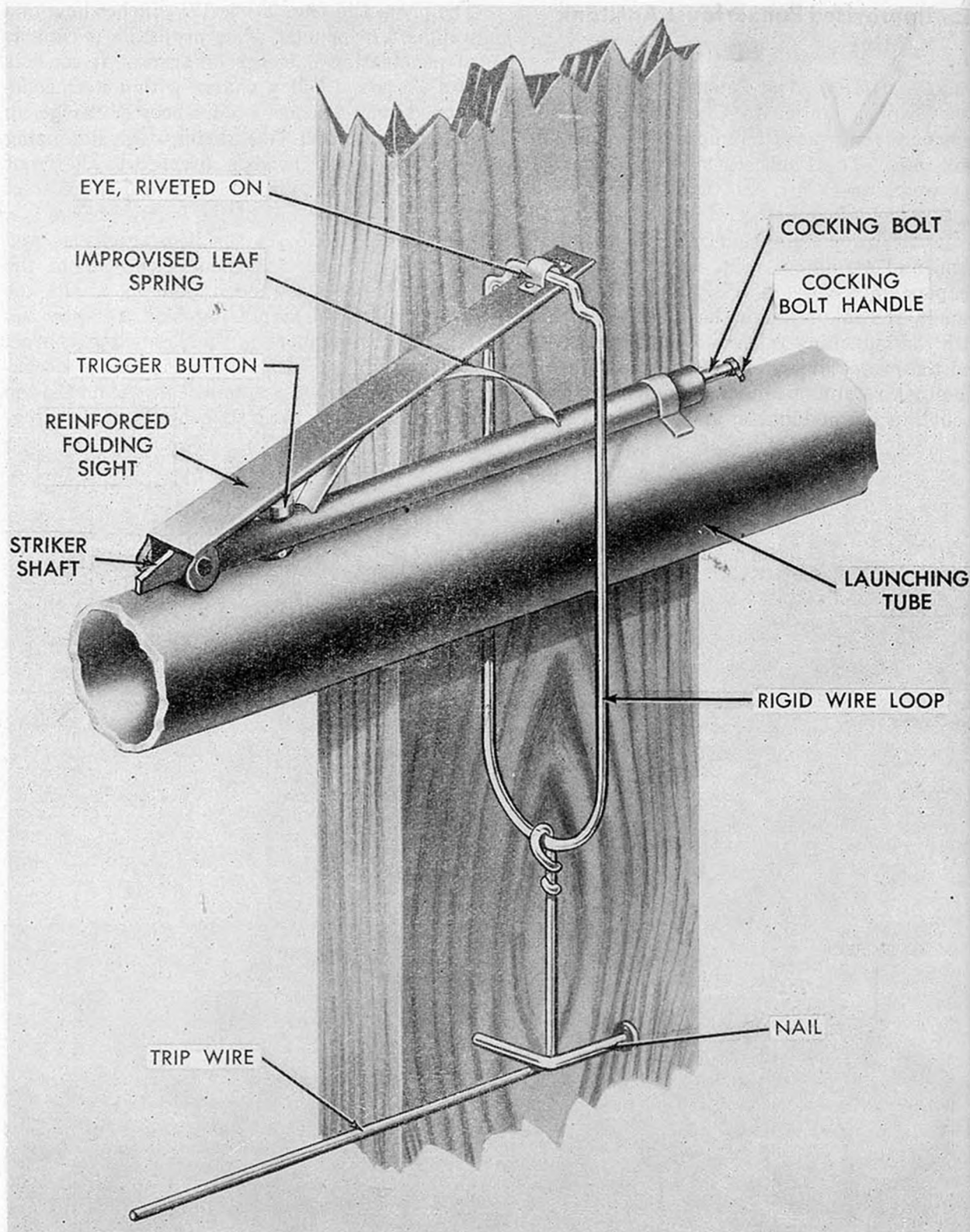


Figure 96. Firing assembly when improvised as an antitank mine.



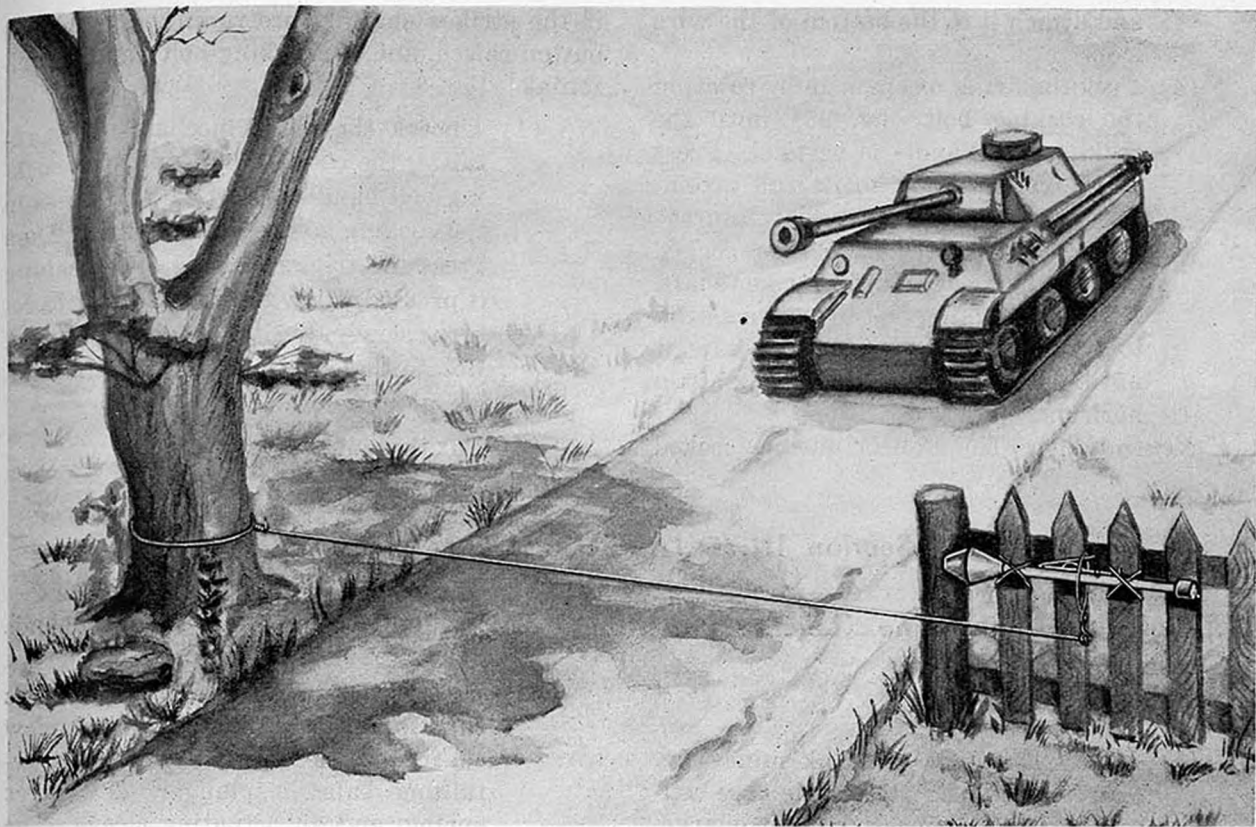


Figure 97. Panzerfaust gross 30 m. rigged as an improvised antitank mine for trip-wire firing.

loaded striker, a percussion cap, a cocking bolt, and a trigger button. The end of the striker shaft is a flat bar with a notch that enables the trigger button to retain the striker in the cocked position. When the Panzerfaust gross 30 m. is to be improvised as an antitank mine, a trip-wire firing assembly is rigged up. The folding sight is used as a trigger lever. It is reinforced by a steel strip held in at each end by bending down the sight at the top and bending up the shortened safety projection at the bottom. This reinforced sight can now pivot back and depress the trigger button (fig. 96). The sight is held off the trigger button by a bent strip of metal improvised as a leaf spring. A rigid wire loop around the weapon passes through an eye riveted to the folding sight. A trip wire is attached to the bottom of the wire loop.

*b. Employment.* The improvised Panzerfaust antitank mine is employed mainly against tanks, and is rigged for trip-wire firing as shown in figure 97.

#### *c. Functioning.*

- (1) When a vehicle runs into the trip wire stretched across its path, the folding sight is pulled down until it depresses the trigger button, which releases the spring-loaded striker against the percussion cap, firing the propelling charge.
- (2) The propelling charge propels the projectile out of the launching tube.
- (3) When the spacer head strikes the vehicle, the impact fuze is actuated, firing the hollow charge.

#### *d. Installing and Arming.*

- (1) Secure the Panzerfaust in an avenue of approach to a tree, fence, or similar object.
- (2) Place an improvised leaf spring consisting of a bent strip of metal between the case that houses the firing mechanism and the folding sight.
- (3) Fasten the trip wire to a tree or stake, draw it across the avenue of approach,

and attach it to the bottom of the wire loop.

- (4) Cock the firing mechanism by rotating the cocking bolt (fig. 96) until the cocking-bolt handle is vertical. Press in the cocking bolt to its full extent. The trigger button should retain the spring-loaded striker in the cocked position by a notch in the striker shaft. Allow the cocking bolt to return slowly to its original position and rotate it until the cocking-bolt handle is again horizontal.

e. *Neutralizing.* The Panzerfaust is cocked

if the striker shaft is protruding, the trigger button raised, and the cocking-bolt handle horizontal.

- (1) Uncock the firing mechanism by rotating the cocking bolt until the cocking-bolt handle is vertical and press in the cocking bolt to its full extent. Then press the trigger button and, keeping it pressed, allow the cocking bolt to return slowly to its original position. Rotate the cocking bolt until the handle is horizontal.
- (2) Cut the slack trip wire.

### Section III. DUAL-PURPOSE MINES

#### 83. Light Antitank Mine (Leichte Panzermine; L.Pz.Mi.)

##### a. *Description.*

- (1) *Mine.* The light antitank mine (fig. 98) consists of a steel mine case containing a steel-encased main charge, five built-in, ball-release type pressure fuzes, a centrally located detonator, a centrally located flash chamber that is connected to each fuze by a flash tube, and a centrally located safety screw that is covered by a protective cap. The safety screw, when screwed all the way down, closes the opening from the flash chamber to the detonator. On the safety screw there is a white line marked *sicher* (safe). The mine case is 10½ inches in diameter and 2½ inches high, and is made up of two shallow, bowl-shaped covers that are lipped to provide a tight joint, which is waterproofed with adhesive tape. On the top cover are five hexagonal fuze plugs that close the fuze wells. Also on the top cover there is a white indicator mark for aligning the safety screw. On the bottom cover are five hexagonal fuze nuts that are directly below the fuzes. These nuts are removed when the mine is to be employed against personnel. The total weight of the mine is 9 pounds,

including the main charge of 5 pounds of cast explosive.

- (2) *Fuze.* Each of the five pressure fuzes consists of a striker with a hollow shaft, a striker spring, two striker-retaining balls, a plunger, a plunger spring, and an actuating sleeve. The striker spring is compressed inside the hollow striker shaft. The top part of the plunger is provided with an opening to take the hollow striker shaft, which is locked to the plunger by the two striker-retaining balls. The actuating sleeve rides on the upper part of the plunger and holds the striker-retaining balls in place. Midway in the plunger is a shoulder that fits inside the fuze case. The plunger spring is retained on the top by the actuating sleeve and on the bottom by the plunger shoulder. The bottom part of the plunger, below the shoulder, is threaded and protrudes through the bottom cover of the mine case. A hexagonal nut on the outside of the bottom cover keeps the plunger in place; this is the fuze nut that is removed when the mine is to be employed against personnel. A percussion cap is screwed into the fuze just below the level of the flash tube.

b. *Employment.* This mine is employed as both an antitank and an antipersonnel mine. It

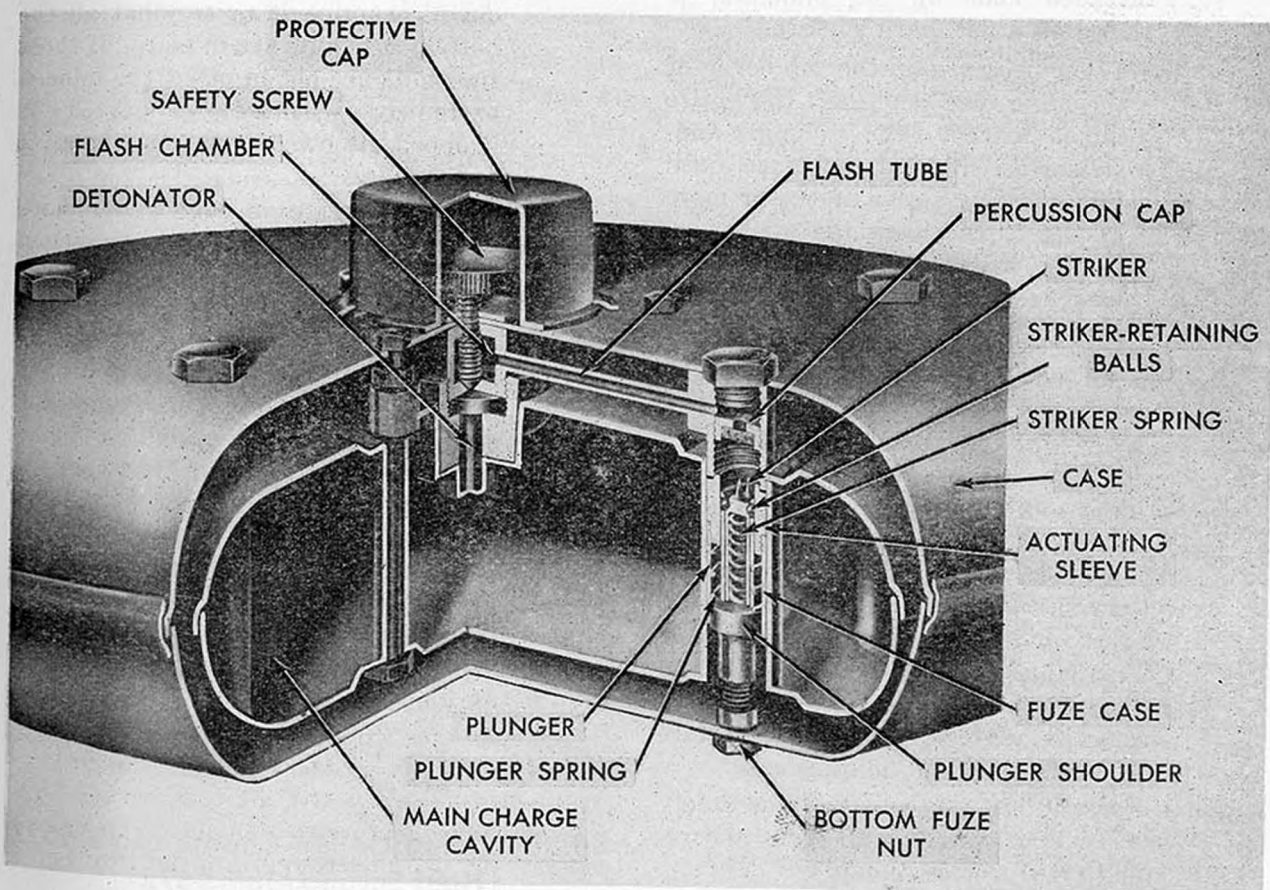
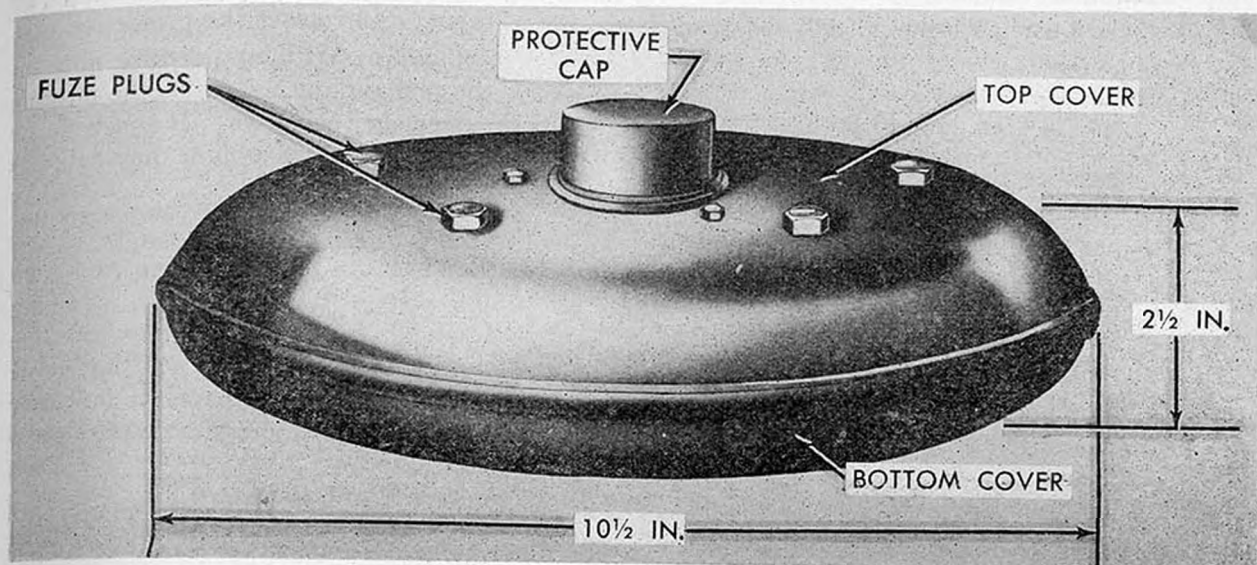


Figure 98. Light antitank mine.



was designed for use by paratroopers to secure jump areas and company positions. Several may be carried and installed by one man.

*c. Functioning.*

(1) *Antitank.*

(a) A pressure of 250 pounds, or more, crushes the top cover of the mine case and depresses the actuating sleeve of one or more of the fuzes until the actuating sleeve clears the striker-retaining balls, releasing the spring-loaded striker against the percussion cap.

(b) The percussion cap produces a flame that travels through the flash tube to the flash chamber, firing the detonator and the main charge.

(2) *Antipersonnel.* The fuze nuts on the bottom cover of the mine case are removed, and the mine, resting on the threaded ends of the plungers, is placed on a flat, hard surface.

(a) Light pressure on the top cover of the mine case depresses the entire mine, except the plunger-and-striker assembly of each fuze, until the actuating sleeve of one or more of the fuzes clears the striker-retaining balls, releasing the spring-loaded striker against the percussion cap.

(b) The percussion produces a flame that travels through the flash tube to the flash chamber, firing the detonator and the main charge.

*d. Installing and Arming.*

(1) Be sure that the fuzes, the percussion caps, the fuze plugs, the fuze nuts, and the centrally located detonator are in place, and that the safety screw is screwed all the way in until the white line marked *sicher* (safe) on the safety screw head lines up with the white indicator mark on the mine case.

(2) For antitank use, unscrew the safety screw approximately 10 turns and replace the protective cap.

(3) For antipersonnel use, remove the bottom fuze nuts from the bottom cover of the mine; gently place the

mine on a flat, hard surface; unscrew the safety screw approximately 10 turns; and replace the protective cap.

**Caution:** Without the fuze nuts on the plungers of the fuzes, the mine is extremely sensitive; if jarred or dropped, its own weight may cause it to explode.

*e. Neutralizing.*

(1) Remove the protective cap and turn the safety screw clockwise, screwing it all the way in, until the white line marked *sicher* (safe) on the screw head lines up with the white indicator mark on the mine case. This action closes the opening between the flash chamber and the detonator.

(2) Check for and neutralize any activating fuzes.

(3) Lift the mine from the hole without tilting it. Before putting the mine down, examine it to see that all the bottom fuze nuts are in place. If these fuze nuts are not in place, the mine is extremely sensitive; if jarred or dropped, its own weight may cause it to explode.

(4) Stand the mine on edge and remove the five top fuze plugs, the percussion-cap holders, and the percussion caps.

(5) Turn the mine upside down and remove the five bottom fuze nuts.

(6) Remove the tape from the joint between the covers of the mine case and pry loose the bottom cover.

(7) Unscrew the three nuts that hold the steel-encased main charge to the top cover.

(8) Remove the steel-encased main charge from the top cover.

(9) Unscrew the detonator holder and remove the detonator.

*f. Packing.* Five of these mines are packed in an open wooden case designed to be parachuted to the ground from aircraft (fig. 99).

## 84. Bounding Hollow-Charge Mine 4672 (Hohl-Sprung Mine 4672)

*a. Description.* The bounding hollow-charge mine (fig. 100) is cylindrical in shape with a

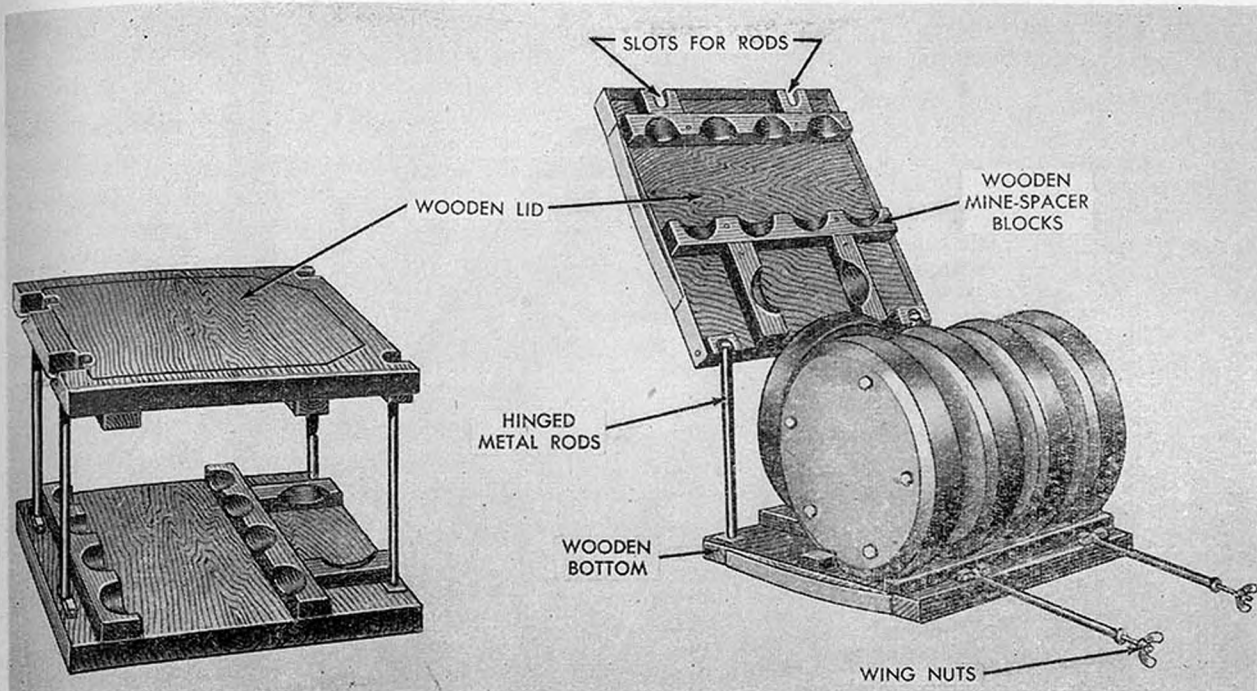


Figure 99. Packing case for light antitank mines.

cone-shaped top. It consists of an outer case, an inner case, a cone-shaped spacer head, an exposed flash tube, a concrete fragmentation collar, a propelling charge, two primer charges,

and a hollow charge, which is the main charge. The outer case is screwed to a wooden base. The inner case contains the concrete fragmentation collar and the main charge. The cone-shaped

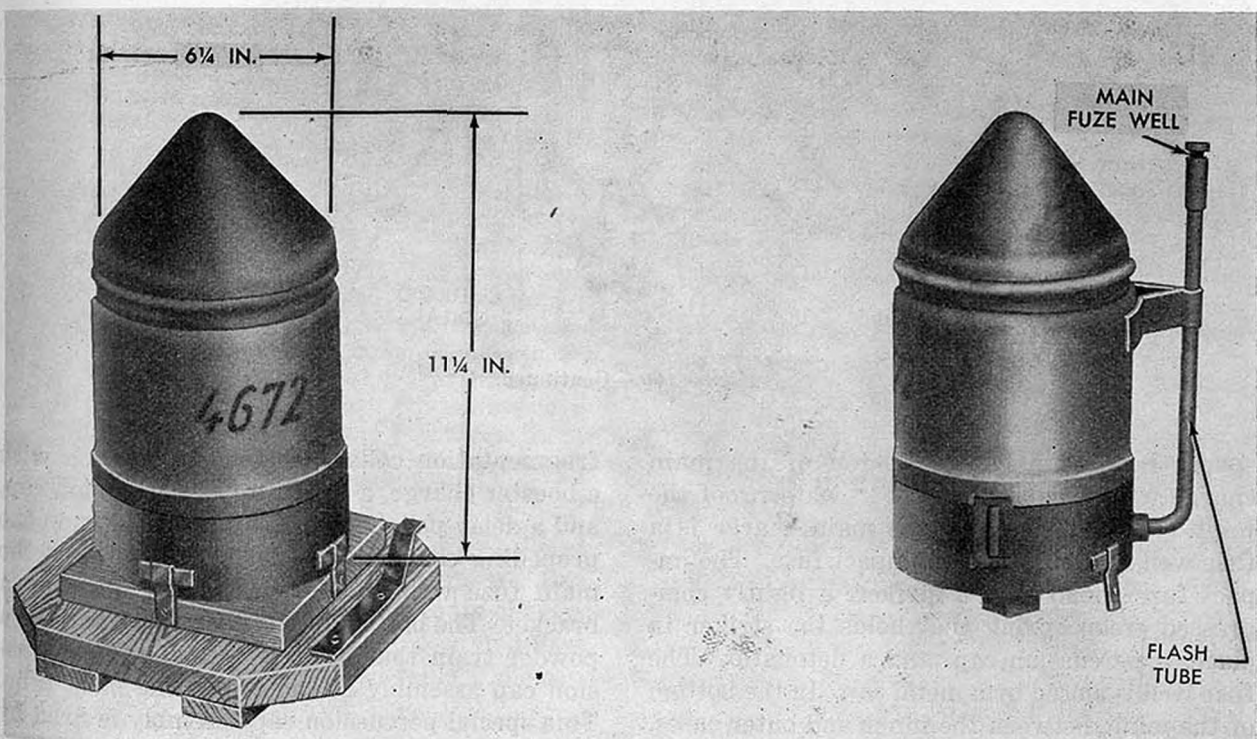


Figure 100. Bounding hollow-charge mine 4672.

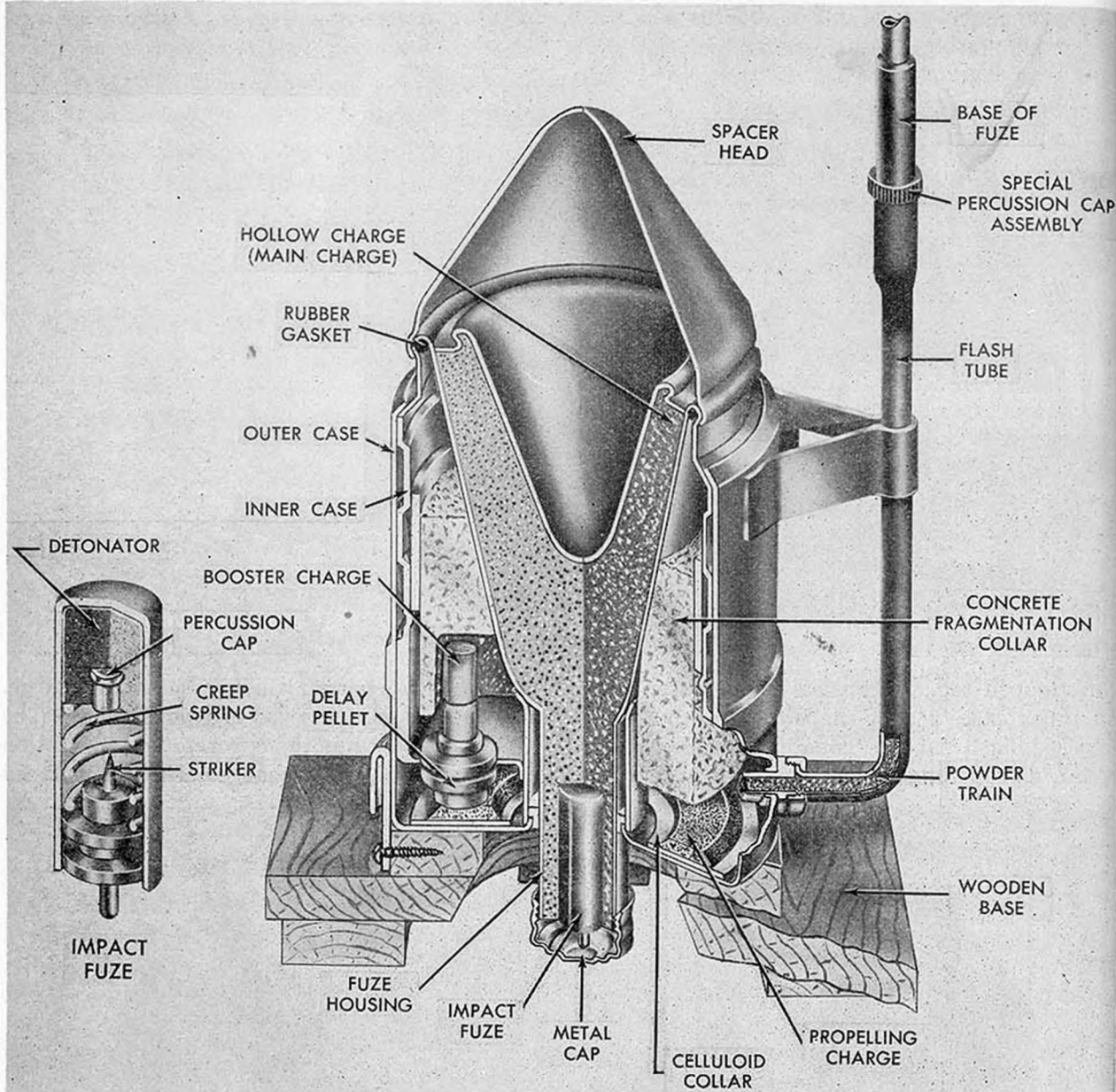


Figure 100.—Continued.

spacer head is fixed to the top of the main charge with a rubber gasket to waterproof the joint. In the bottom of the main charge is a fuze well that contains an impact fuze. The impact fuze consists of a striker, a lightly compressed creep spring that holds the striker in place, a percussion cap, and a detonator. The fuze well is closed by a metal cap. In the bottom of the mine, between the inner and outer cases, is the propelling charge, which rests on a celluloid collar. In the bottom of the concrete

fragmentation collar are two wells, each with a booster charge, a detonator, a percussion cap, and a delay pellet. The delay pellet rests on the propelling charge. The flash tube contains the main fuze well and is held to the mine by a bracket. The bottom of the flash tube contains a powder train that is fired by a special percussion cap assembly at the top of the flash tube. This special percussion cap assembly is fired by the main fuze, which can be a snap fuze 43/I (par. 18) or 43/II (par. 19) or a tilt fuze 43A



(par. 38) or 43B (par. 39). The mine is 6¼ inches in diameter and 11¼ inches long. It weighs a total of 22 pounds, including 3.5 pounds of explosive.

*b. Employment.* This mine is effective against both vehicles and personnel. It was designed to penetrate 4 inches of armor, and for use in all types of terrain, including deep snow.

*c. Functioning.*

- (1) Actuating the main fuze releases a spring-loaded striker against the special percussion cap assembly.
- (2) The flash produced by the special percussion cap assembly ignites the powder train.
- (3) The powder train fires the propelling charge.
- (4) The propelling charge propels the inner case into the air and, at the same time, fires the delay pellets.
- (5) When the spacer head, which provides the correct "stand off," strikes a solid object, such as a tank, the inertia of motion of the striker overcomes the light resistance of the creep spring, and the striker fires the percussion cap, the detonator, and the main charge.
- (6) If the delay pellets burn through before the mine strikes a solid object, they fire the percussion caps, the detonators, the booster charges, and the main charge.

*Note.* In both (5) and (6) above there is fragmentation of the concrete fragmentation collar. This fragmentation is of primary importance in (6) which makes the mine an antipersonnel mine, and only of secondary importance in (5) where penetration is the primary effect and makes the mine an anti-tank mine.

*d. Installing and Arming.*

- (1) Unscrew the metal cap from the fuze well in the bottom of the main charge; insert an impact fuze, closed end first, into the fuze well; and replace the cap.
- (2) Place the mine in a hole so the tip of the spacer head is flush with the surface of the ground.

- (3) Attach the special percussion cap assembly to the flash tube.
- (4) Screw a snap fuze 43/I or 43/II or a tilt fuze 43A or 43B in the main fuze well.
- (5) Arm the main fuze according to the procedure outlined in chapter 5 for the fuze used.

*e. Neutralizing.*

- (1) Neutralize the main fuze according to the procedure outlined in chapter 5 for the fuze used.
- (2) Unscrew the main fuze from the flash tube.
- (3) Remove the special percussion cap assembly from the flash tube.
- (4) Search for and neutralize any activating fuzes.

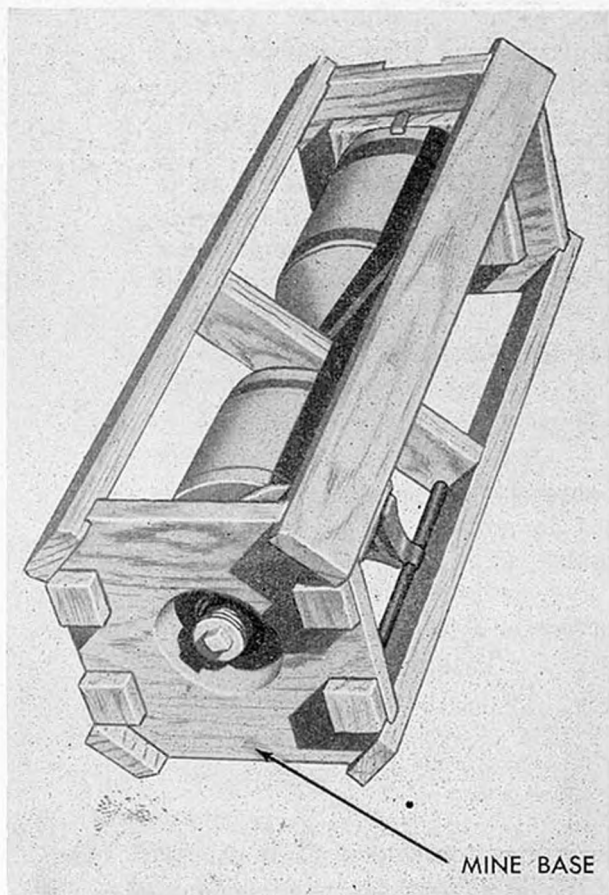


Figure 101. Packing of bounding hollow-charge mine 4672.

- (5) Lift the mine.
- (6) Unscrew the metal cap from the fuze well in the bottom of the main charge, remove the impact fuze, and replace the cap.

*f. Packing.* Two mines are packed in an open wooden crate, the wooden bases of the mines forming the ends of the crate (fig. 101). The impact fuzes are packed separately in cartons of 10.

## CHAPTER 7

### ANTIPERSONNEL MINES

#### Section I. ANTIPERSONNEL MINES

#### 85. S-Mine 35 (Bounding Shrapnel Mine) (S-Mine 35; S.Mi. 35)

##### a. Description.

- (1) *General.* The antipersonnel S-mine 35 (fig. 102) consists of a cylindrical steel mine case 4 inches in diameter and 5 inches high. The mine case contains a centrally located fuze well (which leads to a cavity in the bottom of the mine case for a small propelling charge); three brass detonator wells with a delay pellet in each well; a 16-ounce main charge; and several hundred steel balls which are held against the mine case wall by a thin, cylindrical, steel partition. This mine fits into a cylindrical steel mine container. The total weight of the mine and mine container is 9 pounds. It has an effective casualty radius of 10 to 15 yards and a danger area radius of 100 yards. The fuze normally used with this mine is the S-mine fuze 35 (par. 25). The electrical S-mine fuze 40 (par. 26) was also designed for use with this mine. With a Y-shaped fuze adapter (fig. 103), two pull fuzes 35 (par. 44) or other pull fuzes may be fitted to the mine and laid with trip wires. A W-shaped fuze adapter (fig. 103) was also provided and enabled the mine to be fitted with three fuzes—two pull fuzes in the end fuze wells and an S-mine fuze 35 in the central fuze well.

- (2) *Modifications.* The following is a summary of modifications found on S-mines. All of these changes are usually not present in an individual mine and, although they have some effect

on the functioning of the mine, these changes do not alter the methods of arming or neutralizing.

- (a) Three brass screws at the base connect the mine case to the mine container. The propelling charge must shear these before it projects the mine into the air. This model explodes closer to the ground.
- (b) The steel balls are replaced by scrap steel, such as pieces of broken spring or cut nails.
- (c) The detonator wells are of paper instead of brass. The detonator-well plugs have wooden plugs attached to their under sides. The plugs fit down into the paper detonator wells. In this model of the mine, there are no springs to hold the detonators against the short-delay pellets.
- (d) A wax seal is used instead of the sheet-metal waterproof seal.
- (e) A flat-top plate extends over the mine container to form a seal.
- (f) A detonator replaces the 4½-second delay pellet at the bottom of the fuze well so the mine fires instantaneously, without bounding.
- (g) An activating fuze well is located in the bottom of the mine.

b. *Employment.* This mine is used for local security of units and in antitank mine fields to hinder reconnaissance and breaching parties.

##### c. Functioning.

- (1) Pressure of 15 pounds on the S-mine fuze 35 actuates it, igniting the 4½-second delay pellet at the bottom of the fuze well.



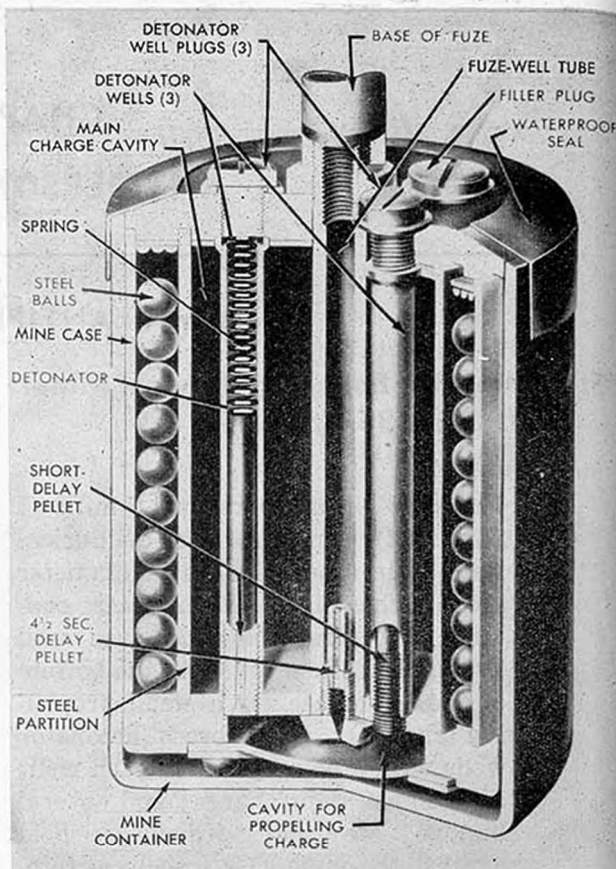


Figure 102. S-mine 35 (bounding shrapnel mine).

- (2) The delay pellet burns through and ignites the propelling charge.
- (3) The propelling charge projects the mine case upward out of the mine container and, at the same time, ignites the short-delay pellets in the detonator wells.
- (4) The short-delay pellets burn through and set off the detonators and the main charge when the mine is from 3 to 5 feet in the air.
- (5) The main charge scatters the steel balls, and fragments of the mine case, within a radius of 100 yards.

*d. Installing and Arming.*

- (1) Unscrew the three detonator-well plugs from the detonator wells, remove the springs, and insert either three standard German No. 8 detonators, or three United States nonelectric blasting caps, *open end down*.

- (2) Replace the springs and the detonator well plugs.
- (3) Unscrew the shipping cap from the fuze well and screw in either an S-mine fuze 35; a Y-shaped fuze adapter (fig. 103) with two pull fuzes; a W-shaped fuze adapter with one pressure fuze 35 and two pull fuzes (fig. 103); or an electrical bridge and an electrical S-mine fuze 40 set (fig. 31).
- (4) Place the mine in a hole so the tops of the fuze or fuzes are slightly above ground level. If pull fuzes are used, attach trip wires to the fuzes and to an anchor.
- (5) Remove the safety pins.

*e. Neutralizing.*

- (1) Insert a nail in the safety-pin hole of each pressure or pull fuze.
- (2) Cut any slack trip wires, after checking the anchored ends for pull fuzes.

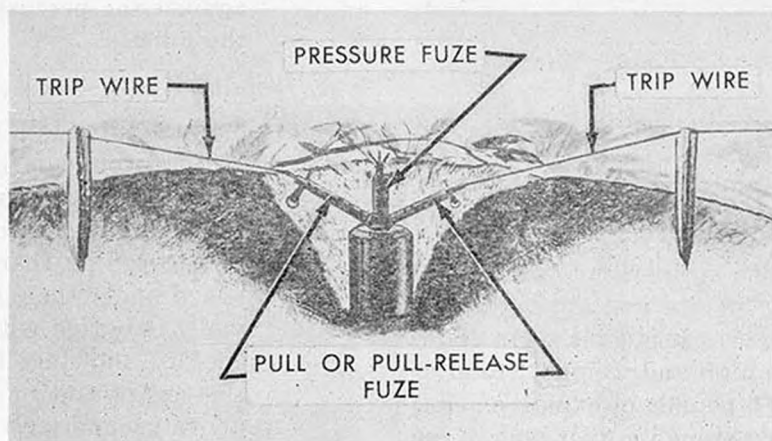
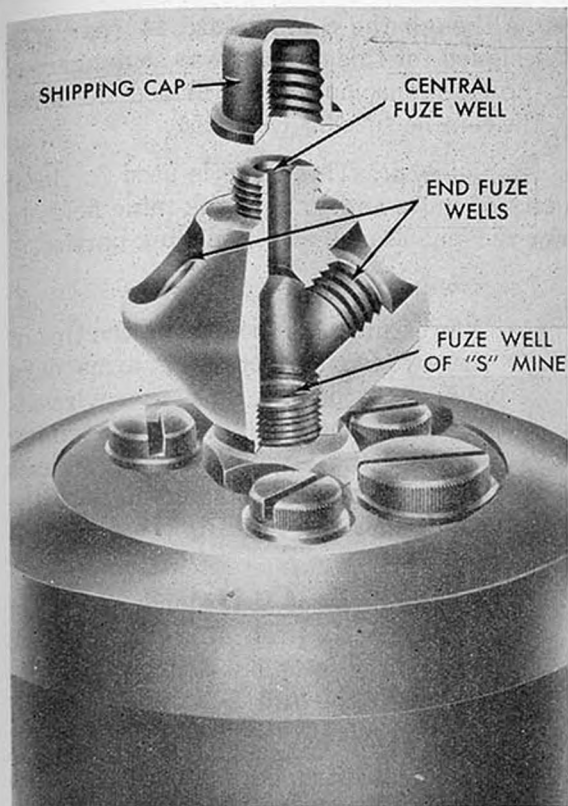


Figure 103. Y- and W-shaped fuze adapters fitted to the S-mine 35, and installation with the W-shaped adapter.

- (3) Check the mine for activating fuzes and neutralize any that are found.
- (4) Remove the mine from the ground.
- (5) Unscrew the pressure or pull fuze or fuzes.
- (6) Unscrew the three detonator-well plugs and remove the springs and detonators by turning the mine upside down and shaking it.

*f. Packing.* These mines are shipped with the detonators removed and the detonator-well plugs in the detonator wells. A shipping cap is placed on the fuze well. Three mines are packed either in a watertight, metal carrying case or in a wooden crate (fig. 104). The total weight of the packed metal carrying case is about 33 pounds.



Figure 104. Carrying cases for S-mines 35.

## 86. S-Mine 44 (Bounding Shrapnel Mine) (S-Mine 44; S.Mi. 44)

*a. Description.* The antipersonnel S-mine 44 (fig. 105) is similar in size and appearance to the S-mine 35 (par. 85). It is 4 inches in diameter and 5 $\frac{1}{8}$  inches high and weighs a total of 9 pounds, including 5 pounds of explosive. The explosive is inserted through a filler hole in the cover plate. This mine differs from the S-mine 35 in that the fuze well is not centrally located but is at the side of the cover plate. The fuze well contains a 4 $\frac{1}{2}$ -second delay pellet and a propelling charge. In the center of the cover plate is a detonator well for insertion of a detonator. At the base of the detonator well is a pull type, ball-release fuze. A pull wire, usually 2 $\frac{1}{2}$  feet long, ties the release pin of the pull type, ball-release fuze to the base of the mine container. The height at which the mine explodes is controlled by the length of the pull

wire. Although the S-mine fuze 44 (par. 37) was designed for this mine, it was so dangerous that the Germans most often armed the mine with the S-mine fuze 35 (par. 25).

*b. Employment.* This mine is used for local security of units and in antitank mine fields to hinder reconnaissance and breaching parties.

### *c. Functioning.*

- (1) A pressure of 20 pounds on the tips of the two striker-retaining arms or a pull of 14 pounds on a trip wire attached to one of the striker-retaining arms of the S-mine fuze 44 releases the spring-loaded striker against the percussion cap, igniting the delay pellet.
- (2) After a delay of 4 $\frac{1}{2}$  seconds, the delay pellet fires the propelling charge which propels the mine out of the mine container to the full 2 $\frac{1}{2}$ -foot length of the pull wire.
- (3) The pull wire pulls the release pin from the pull type, ball-release fuze, releasing the spring-loaded striker against the percussion cap and firing the mine.

### *d. Installing and Arming.*

- (1) Lay the mine in a hole in the ground. If the ground is not firm enough to keep the mine container from being driven further into the ground when the propelling charge is fired, place a board under the mine. The mine normally is buried with only the arms of the fuze showing. In winter, however, the entire top of the fuze must be above ground level.
- (2) Unscrew the detonator-well plug and insert a detonator, open end down, and replace the plug.
- (3) Screw an S-mine fuze 35 or 44 into the fuze well. Attach trip wires to the arms of the S-mine fuze 44, if desired.
- (4) Arm the fuze by pulling out the safety pin.

**Caution:** If the S-mine fuze 44 is used, remove the safety pin with wire or rope from a distance of 50 yards.



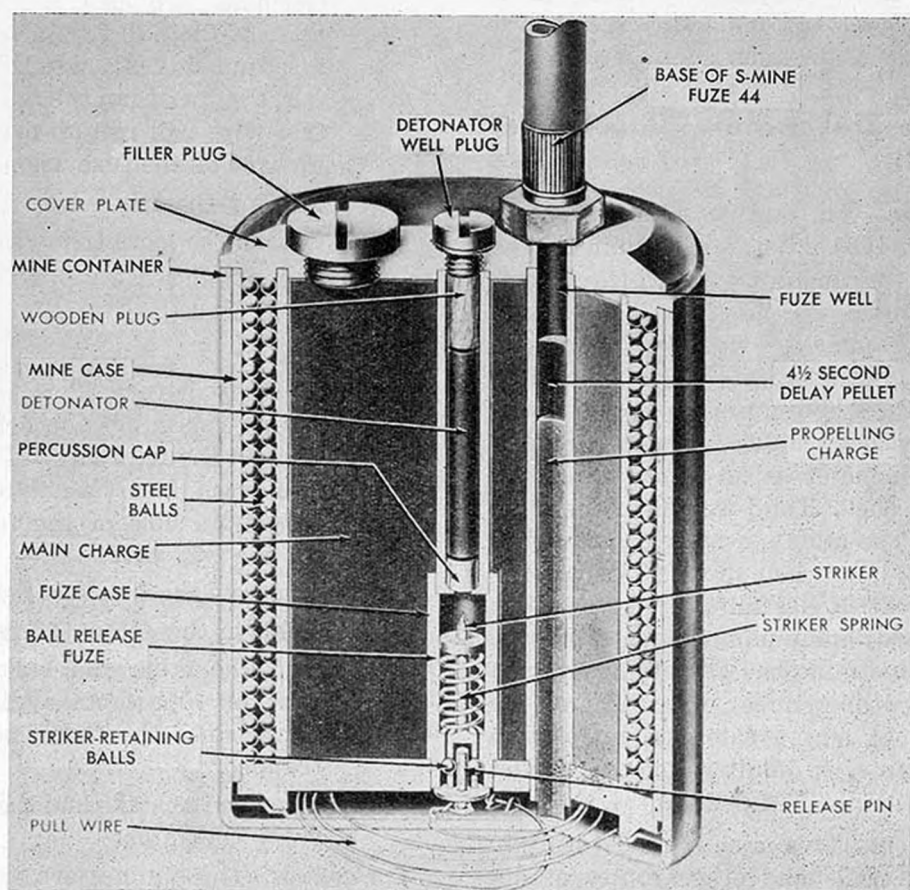
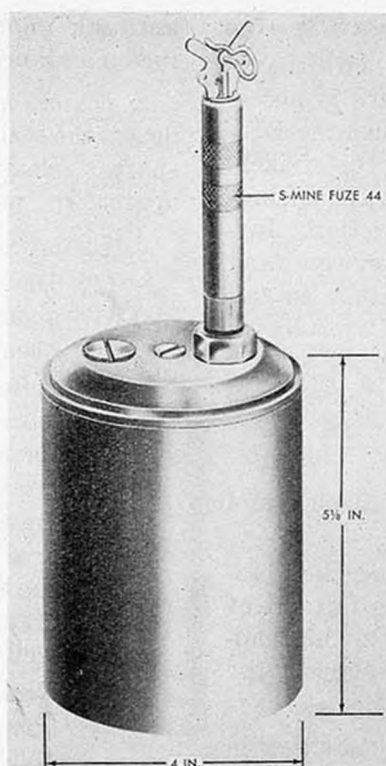


Figure 105. S-mine 44 (bounding shrapnel mine).

*e. Neutralizing.*

- (1) When the mine is armed with the S-mine fuze 44, extreme care is necessary in neutralizing it. When the safety pin has been removed, the striker-retaining arms are holding the spring-loaded striker only by friction. Jarring or touching the striker-retaining arms could easily cause them to fall off, releasing the striker. Carefully insert a nail or wire through the safety-pin holes before cutting any trip wires. Then cut the trip wires.
- (2) Unscrew the fuze.
- (3) Unscrew the detonator-well plug and remove the detonator.

**Caution:** When removing the detonator, do not let the mine fall out of the mine container. Should this happen, the pull wire may actuate the mine.

*f. Packing.* Three mines are packed either in a watertight, metal carrying case or in a wooden crate. Fuzes and detonators are packed in containers, separate from the mines.

## **87. Concrete Stake Mine (Stockmine; Sto. Mi.)**

*a. Description.* The antipersonnel concrete stake mine (fig. 106) consists of a main charge surrounded by a concrete case which is embedded with metal fragments. The German 100-gram (0.25-pound) standard bore-hole charge is used as the main charge. The mine itself is 6½ inches long and 3 inches in diameter. A round wooden stake, 14 inches long and 1½ inches in diameter, is set in the lower end of the concrete shell. Total weight of the mine is 4.5 pounds. The mine normally uses the pull fuze 42 (par. 42), but the pull fuze 35 (par. 44) can also be used. It has an effective casualty radius of 10 yards and a danger-area radius up to 66 yards. This mine has been founded with a serrated, cast-iron cylinder placed around the concrete body to add greater fragmentation effect. The mine is similar to the Soviet POMZ-2 stake mine (TM 5-223A).

*b. Employment.* This mine is used with trip wires to block trails and other routes of approach to unit positions. It is also employed in

antitank mine fields to hinder, and warn of, reconnaissance and breaching parties.

*c. Functioning.* A pull on the trip wire withdraws the striker-retaining pin from the striker shaft, releasing the spring-loaded striker against the percussion cap and firing the mine.

*d. Installing and Arming.*

- (1) Drive the stake into the ground until about 5 inches of it remains above the ground.
- (2) Assemble the mine by inserting the main charge, fuze-well end first, in the large hole in the bottom of the concrete shell.
- (3) Insert a pull fuze 42, with detonator, or a pull fuze 35, with detonator, into the small hole in the top of the concrete case and screw it into the fuze well of the main charge.
- (4) Put the mine on the stake; or, if a tree is used, tie the mine to the tree and plug the hole in the bottom. The Germans provided a cork plug for this. If the pull fuze 35 is used, drive a second stake, beside the mine, keeping it higher than the mine so that the trip wire will run up over it and pull upward on the fuze when it is tripped.
- (5) Anchor the trip wire.
- (6) Attach the loose trip wire to the fuze.
- (7) Pull out the safety pin if the pull fuze 35 is used.

*e. Neutralizing.*

- (1) If the pull fuze 42 is used, hold the striker-retaining pin firmly in place and cut the trip wire. If the pull fuze 35 is used, insert a nail or wire in the safety-pin hole of the fuze and then cut the trip wire.
- (2) Unscrew the fuze and detonator.
- (3) Remove the detonator from the fuze.
- (4) Pull the mine and stake loose with wire or rope from a distance of 50 yards since the stake may be booby-trapped.
- (5) Remove the stake and the main charge from the mine.

*f. Packing.* These mines are packed six to a wooden chest. The weight of the mines and

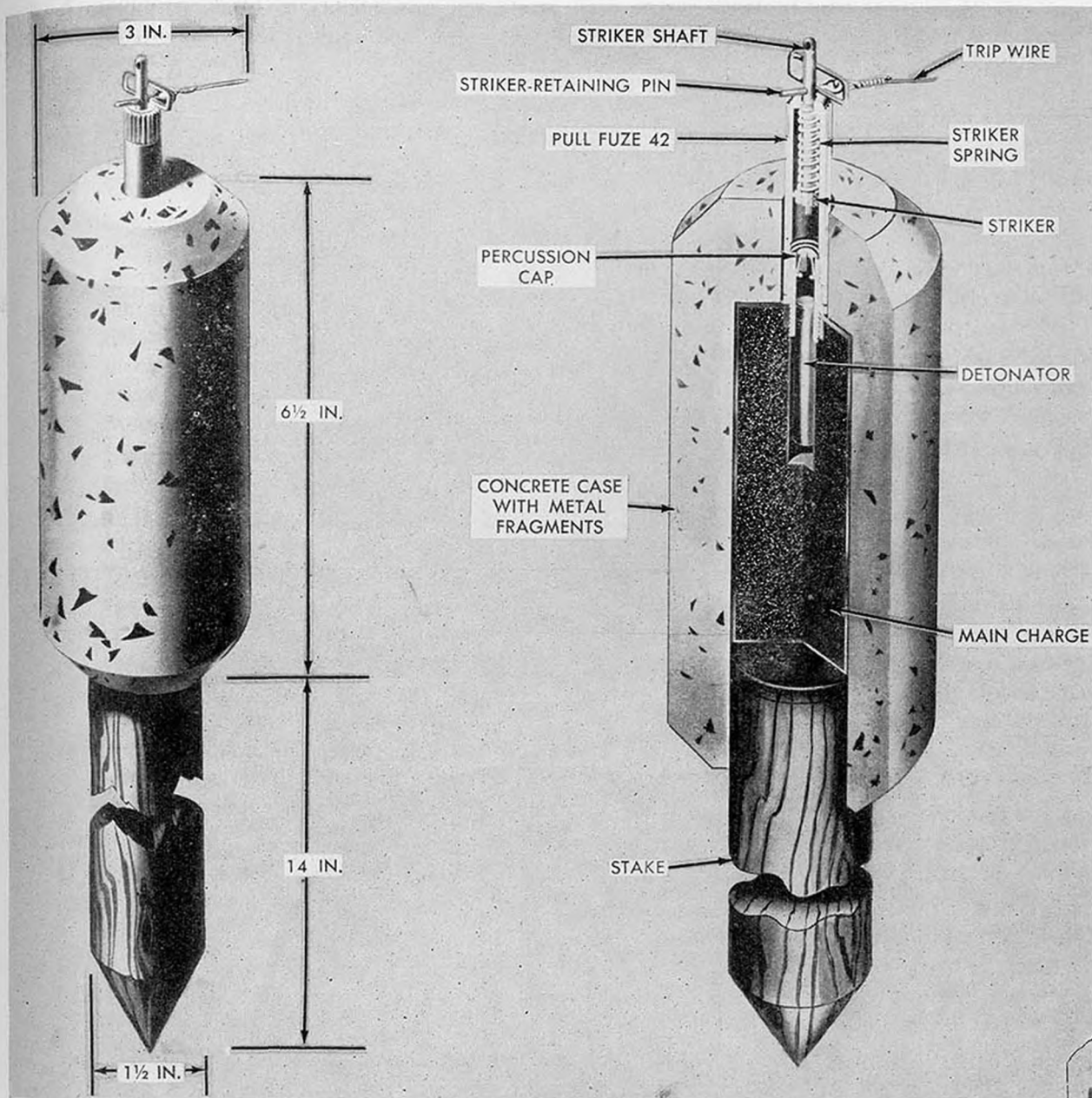


Figure 106. Concrete stake mine.

chest is about 39 pounds. A separate bundle of six stakes is supplied with each chest of mines.

## 88. Concrete Ball Mine

*a. Description.* The antipersonnel concrete ball mine (fig. 107) consists of a main charge encased in a ball-shaped case of concrete, 10 inches in diameter, embedded with metal fragments. The total weight of the mine is about 20 pounds, including the main charge of about

1.5 pounds of explosive blocks. This mine is fuze with the fuze lighter 29 (par. 48). The fuze and the detonator holder are held in position in the mine by a wooden block, the fuze being held in the wooden block by wedges. The fuze and the detonator are connected by 2 inches of time fuze, which takes about 10 seconds to burn through. The mine has an effective casualty radius of 15 yards and a danger-area radius up to 150 yards.



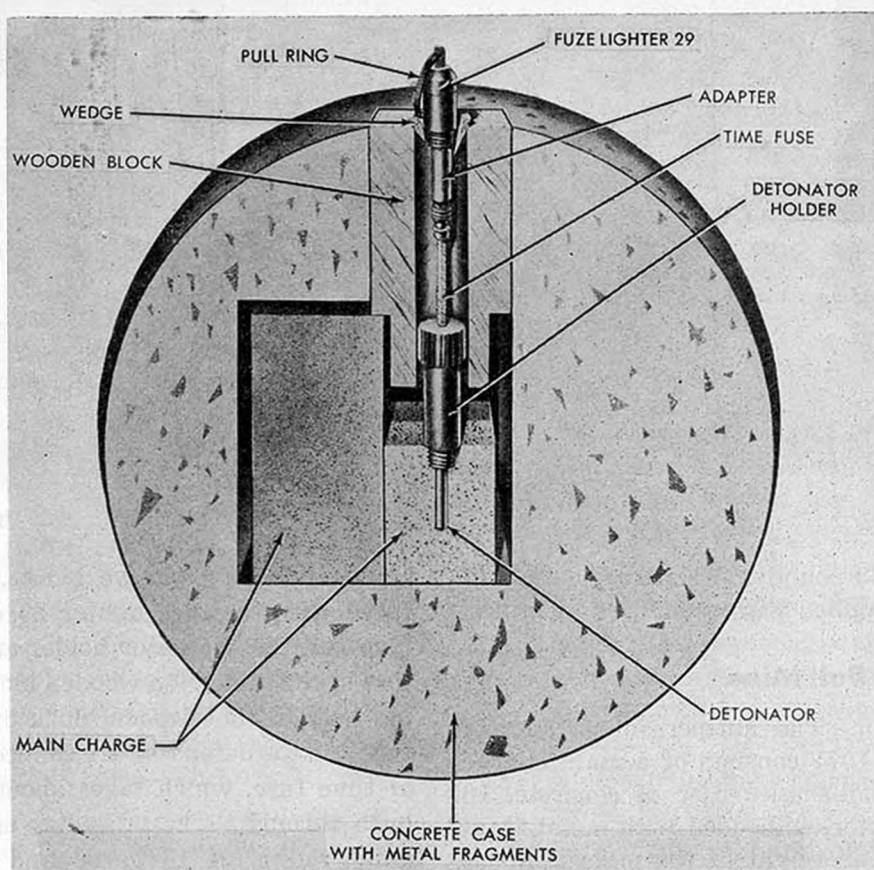
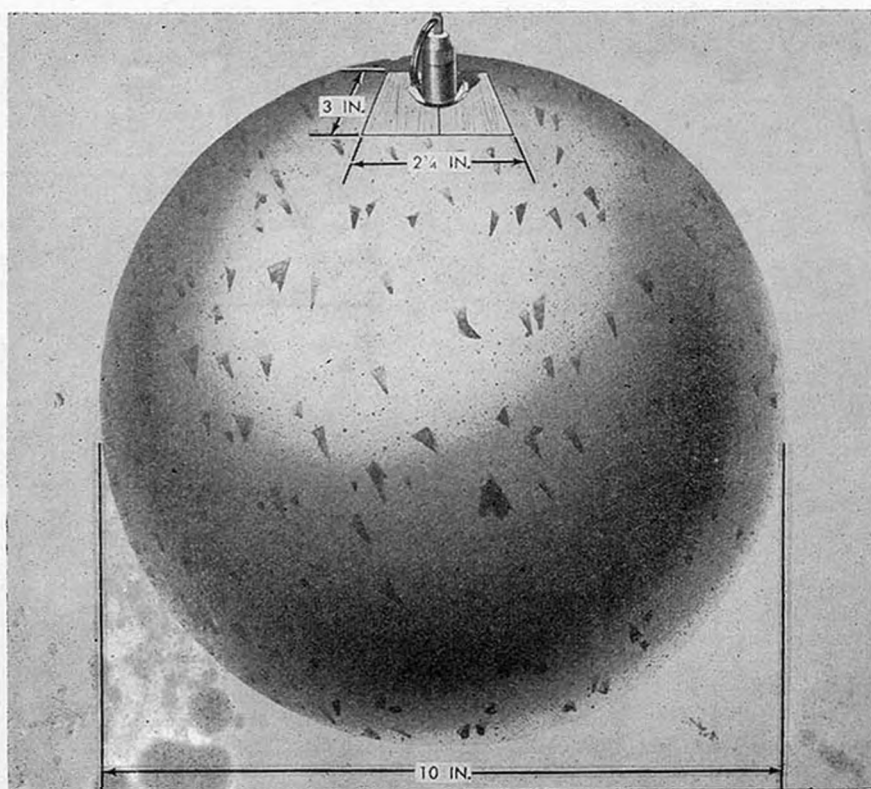


Figure 107. Concrete ball mine.

*b. Employment.* This mine was installed along trails and in antitank mine fields with one or more trip wires. It was also used as a grenade by rolling it downhill.

*c. Functioning.* A pull on the pull ring of the fuse lighter 29 ignites the time fuze, which fires the detonator and the main charge.

*d. Installing and Arming.*

- (1) Attach the fuse lighter 29 by means of the time fuze adapter to a short length of time fuze equipped with a detonator and insert in a wooden block, wedging the fuse lighter in place with wooden wedges, as shown in figure 107.
- (2) Screw the detonator holder and detonator into a block of explosive.
- (3) Install the fuze assembly in the concrete case.
- (4) Place the mine on the ground with the fuze assembly horizontal and secure the mine in place with stakes so that it will not be pulled out of place by the action required to actuate the fuse lighter by the trip wire.
- (5) Attach the trip wire, first at the anchor end then to the pull ring of the fuse lighter.

*e. Neutralizing.*

- (1) Cut the trip wire.
- (2) Tape the pull ring to the case of the fuse lighter.
- (3) Remove the fuze assembly.
- (4) Disassemble the fuze assembly.

## 89. Pot Mine A 200 (Behelfs Schutzmine A 200)

*a. Description.* The antipersonnel pot mine A 200 (fig. 108) consists of a small, cylindrical metal case containing 7 ounces (200 grams) of powdered explosive. It is 2 inches high and 3 inches in diameter at the top and has a total weight of 13 ounces. A plastic detonator holder, a detonator, fuze adapter, and a Buck chemical fuze (par. 28) are centrally located in the top of the case. This mine was called the "mustard pot" by troops in World War II. A modification of this mine, called the pot mine A 202, differs slightly from the A 200. It has a removable lid

with a threaded fuze well which receives the fuze directly, without the necessity of a fuze adapter, and a built-in metal detonator holder attached to the removable lid.

*b. Employment.* This mine is laid along road shoulders, trails, and hedgerows as an antipersonnel mine. It is normally buried with just the fuze above ground.

*c. Functioning.*

- (1) A pressure of about 15 pounds on the Buck chemical fuze crushes it and breaks the glass vial.
- (2) The mixture of the chemical from the glass vial with the white powder surrounding the vial produces a flash.
- (3) The flash sets off the detonator and the main charge.

*d. Installing and Arming.*

- (1) Unscrew the fuze adapter and insert the detonator in the detonator holder.
- (2) Screw the fuze adapter into the detonator holder.
- (3) Screw a Buck chemical fuze into the fuze adapter by holding it by the base, not by the fragile aluminum shell.
- (4) Install the mine in one of the following ways (fig. 109).
  - (a) Place the mine in a hole so the top of the fuze is level, or slightly below, the surface of the ground. If desired, carefully place a pressure board over the fuze to increase the pressure area.
  - (b) Place the mine in a hole so the entire fuze projects above the surface of the ground.
  - (c) Lay the mine on the surface of the ground.

*Note.* When laying more than one mine, keep at least 3-foot intervals between mines to reduce the possibility of sympathetic detonation.

*e. Neutralizing.* This mine has no safety devices or activating fuze wells.

- (1) Unscrew the Buck chemical fuze by holding it by the base, not by the fragile aluminum shell.
- (2) Unscrew the fuze adapter and tip the mine so the detonator falls out into the hand.

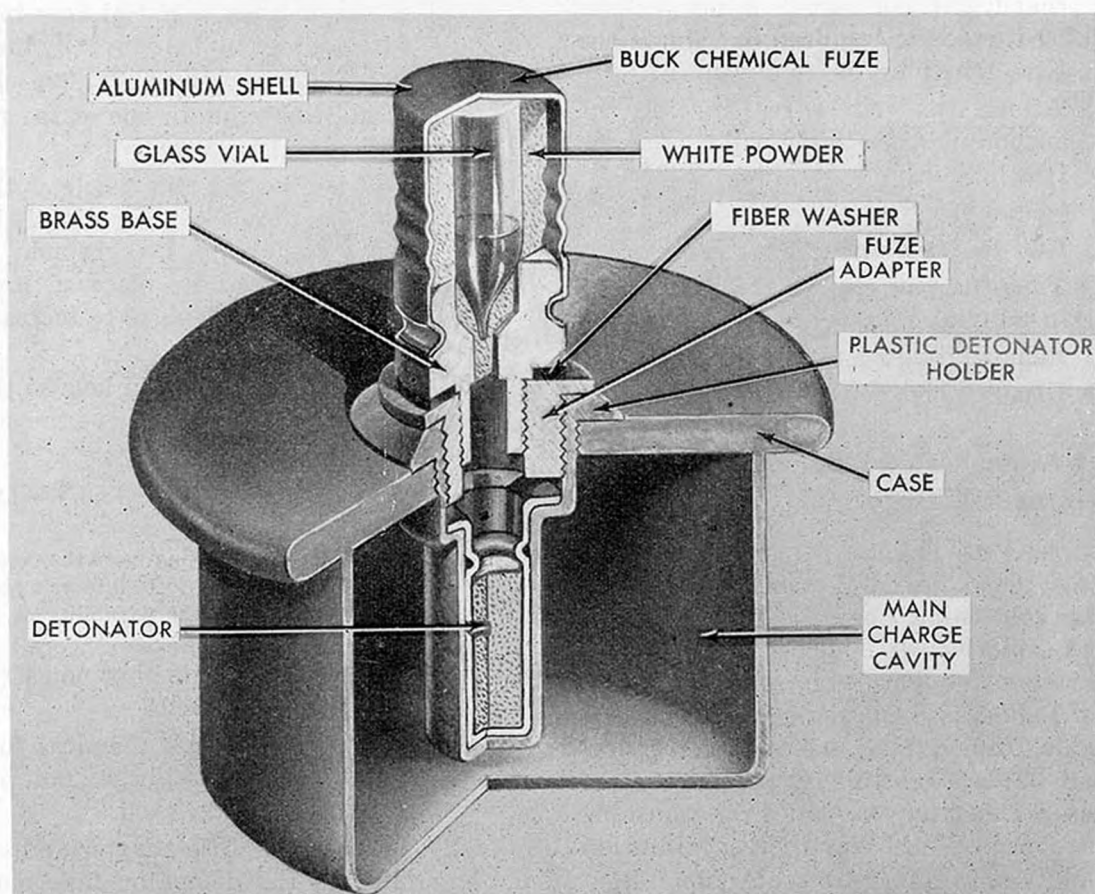
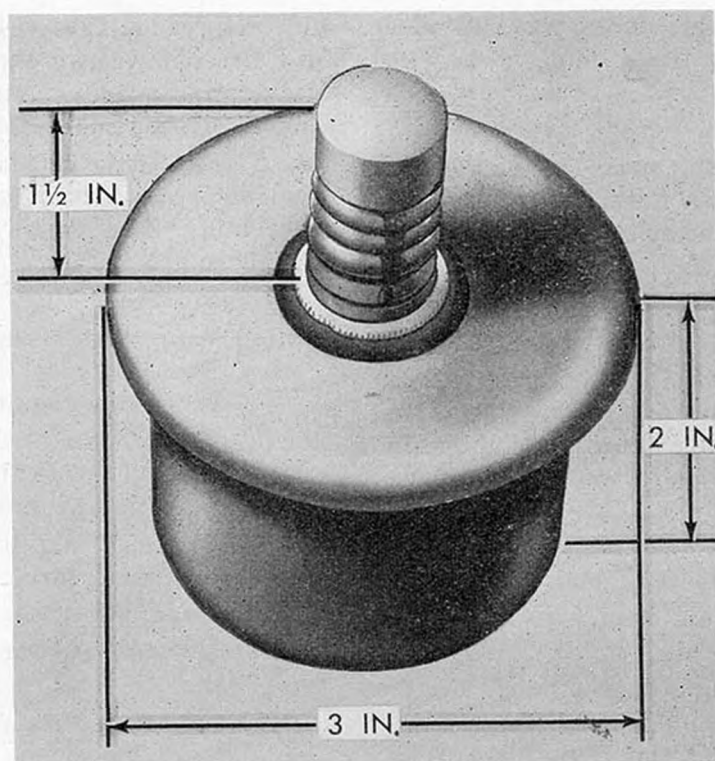


Figure 108. Pot mine A 200.



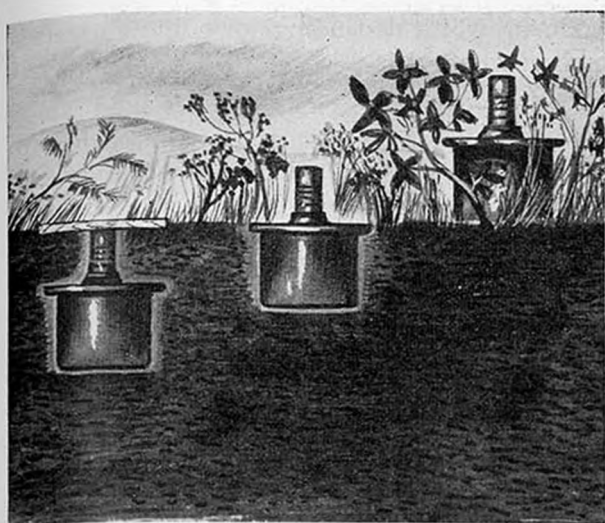


Figure 109. Methods of installing the pot mine A 200.

*Note.* This mine is easily detected by any mine detector. If the probing method of mine location is used, be careful not to crush the aluminum shell of the fuze. If the fuze is crushed or pierced, the mine will explode.

## 90. Pot Mine S 150 (Behelfs Schutzmine S 150)

*a. Description.* The antipersonnel pot mine S 150 (fig. 110) is similar to the pot mine A 200 but consists of a thinner case with a removable lid. It contains 150 grams (5.25 ounces) of explosive. The case is  $2\frac{1}{2}$  inches in diameter

and 2 inches high. The lid overlaps the case and is held in place with adhesive tape. A plastic detonator holder, a detonator, a fuze adapter, and a Buck chemical fuze (par. 28) are centrally located in the top of the case.

*b. Employment.* This mine is used for unit security and is installed in ditches and on trails along the approach routes to unit positions. This mine is also used in booby-trap installations.

### *c. Functioning.*

- (1) A pressure of about 15 pounds on the Buck chemical fuze crushes it and breaks the glass vial.
- (2) The mixture of the chemical from the glass vial with the white powder surrounding the vial produces a flash.
- (3) The flash sets off the detonator and the main charge.

### *d. Installing and Arming.*

- (1) Insert the detonator in the detonator holder.
- (2) Screw a Buck chemical fuze into the fuze adapter by holding it by the base, not by the fragile aluminum shell.
- (3) Install the mine in one of the following ways (fig. 109).
  - (a) Place the mine in a hole so the top of the fuze is level, or slightly below, the surface of the ground. If

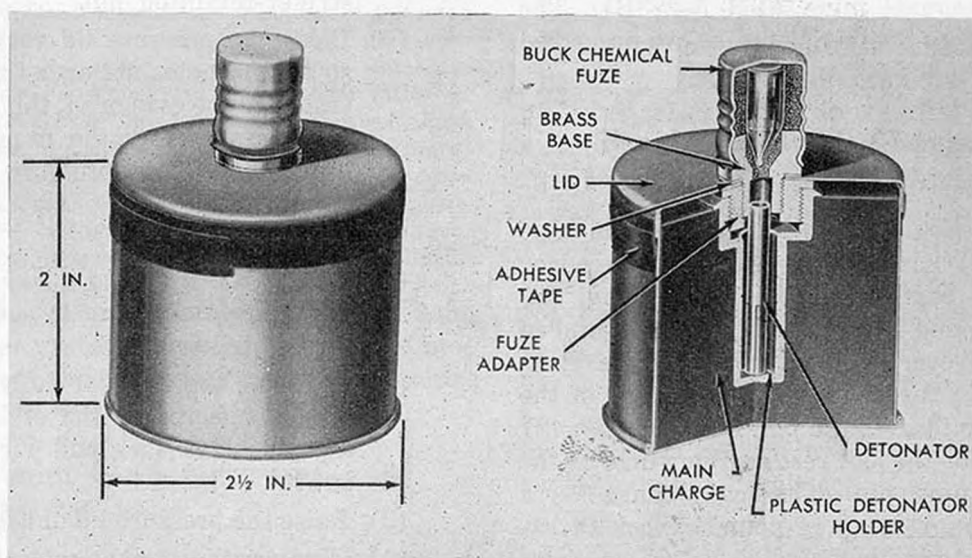


Figure 110. Pot mine S 150.

desired, carefully place a pressure board over the fuze to increase the pressure area.

- (b) Place the mine in a hole so the entire fuze projects above the surface of the ground.
- (c) Lay the mine on the surface of the ground.

*Note.* When laying more than one mine, keep at least 3-foot intervals between mines to reduce the possibility of sympathetic detonation.

*e. Neutralizing.* This mine has no safety devices or activating fuze wells.

- (1) Unscrew the Buck chemical fuze by holding it by the base, not by the fragile aluminum shell.
- (2) Tip the mine so the detonator falls out into the hand.

*Note.* This mine is easily detected by any mine detector. If the probing method of mine location is used, be careful not to crush the aluminum shell of the fuze. If the fuze is crushed or pierced, the mine will explode.

## 91. Schü'mines

Schü'mines were among the most commonly encountered German antipersonnel mines in World War II. This type of mine consists of a small wooden or cardboard case with a hinged lid and functions under pressure. It was patterned after the Soviet PMD mines (TM 5-223A) which were copied from a similar Finnish antipersonnel mine (TM 5-223B). The three variations of the Schü'mine are described in paragraphs 92, 93, and 94.

### 92. Schü'mine 42 (Schützenmine 42; Schü. Mi. 42)

*a. Description.* The antipersonnel Schü'mine 42 (fig. 111) has an impregnated plywood or pressed cardboard case  $4\frac{3}{4}$  inches long,  $3\frac{1}{4}$  inches wide, and  $1\frac{3}{4}$  inches high with a hinged pressure lid overlapping the case. The pressure lid has a fuze slot cut in the center of the front edge to fit over the pull fuze 42 (par. 42) so the sides of the slot rest on the wings of the striker-retaining pin. The main charge is a standard 200-gram (0.44 pound) block of explosive. The mine has a total weight of about 1.1 pounds. It is painted gray, tan, black, olive

drab, or white depending upon the surroundings in which it is laid.

*b. Employment.* This mine is laid along paths, trails, road shoulders, approaches to likely fords across rivers and streams, and in antitank mine fields. It may be laid unburied in grass or wooded areas and covered with leaves or other vegetation.

*c. Functioning.* Pressure of 6 to 11 pounds on the pressure lid pushes the striker-retaining pin out of the fuze, releasing the spring-loaded striker against the percussion cap and firing the mine.

#### *d. Installing and Arming.*

- (1) Open the pressure lid and place the main charge so the fuze well faces the hole in the front end of the case.
- (2) Screw the fuze, with detonator, into the main charge through the hole in the mine case.
- (3) Push the main charge and the fuze toward the back of the mine case until the striker-retaining pin touches the outside of the case.
- (4) Turn the striker shaft so the wings of the striker-retaining pin are horizontal and below the striker shaft.
- (5) If the mine is to be activated, drive a stake into the ground under the fuze and tie a length of wire to the stake and to the end of the loop of the striker-retaining pin.
- (6) Close the pressure lid very carefully so the fuze slot fits over the fuze and rests on the wings of the striker-retaining pin. Lay the mine with the hinged end of the pressure lid toward the enemy.

#### *e. Neutralizing.*

- (1) Check the fuze to make sure the striker-retaining pin is seated firmly in the striker shaft.
- (2) Examine the fuze carefully for a pull wire connected to the striker-retaining pin. If a slack pull wire is found, cut it.
- (3) Raise the pressure lid of the mine.
- (4) Holding the striker-retaining pin in place, unscrew the fuze.

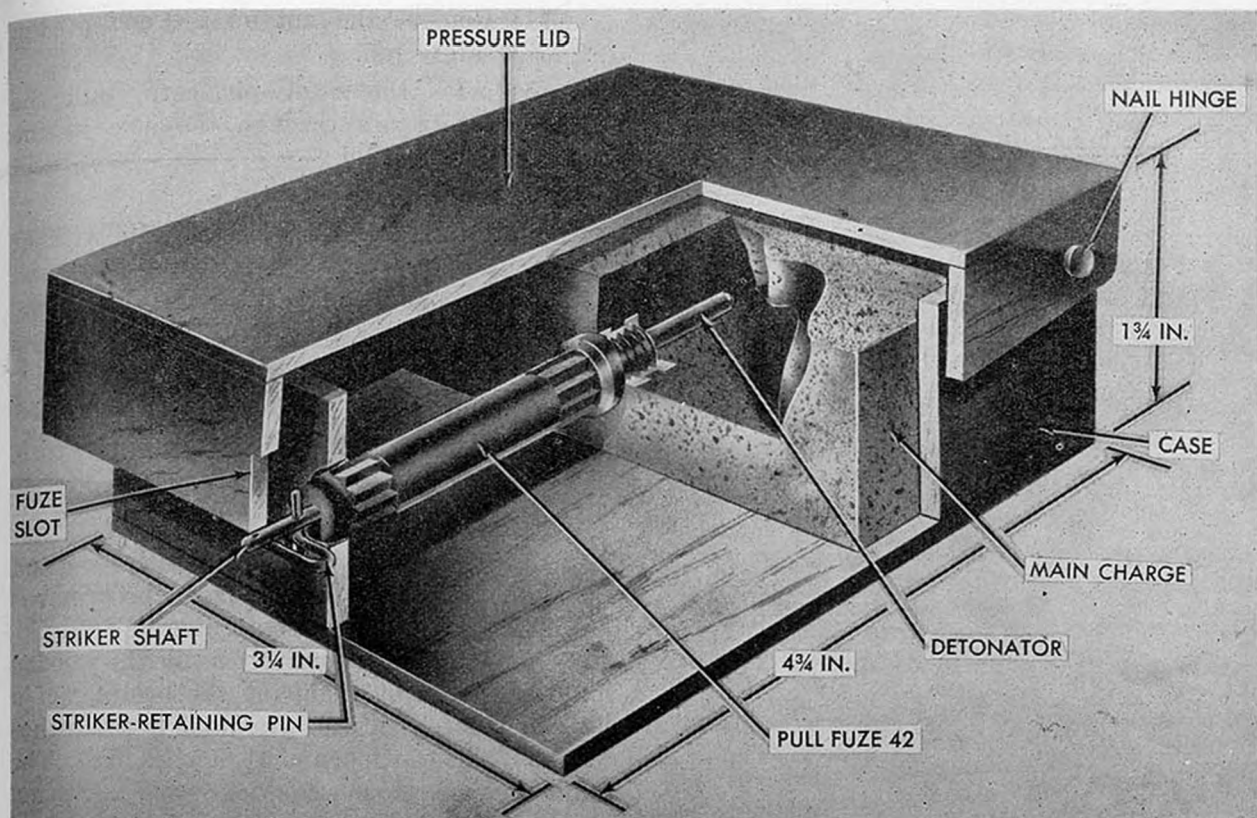


Figure 111. Schü'mine 42.

- (5) Remove the detonator from the fuze.

**Caution:** Destroy the mine in place if the striker-retaining pin is partially withdrawn or if there is difficulty in cutting the pull wire.

**Note.** The small metal content of this mine makes it extremely difficult to detect with electronic mine detectors, and its small size makes it difficult to find by observation or probing. A United States mine probe M1 or a light probe made of a round bar one-fourth inch in diameter and pointed at one end are suitable probes. If these probes are not available, a bayonet may be used with caution. The probe is held at an angle of approximately 30° to the ground.

*f. Packing.* These mines are packed in light open wooden crates, 20 mines to a crate. Detonators, fuzes, and charges are packed separately.

### 93. Schü'mine 44 (Schützenmine 44; Schü. Mi. 44)

*a. Description.* The antipersonnel Schü'mine 44 (fig. 112) uses the pull fuze 35 (par. 44)

with a nail inserted in the trip wire (outer) hole of the striker shaft. The side of the pressure lid which contains the fuze slot is angled in toward the mine case and the nail in the pull fuze 35 bears against the outside of the pressure lid. The safety-pin cord passes through a hole provided in the top of the pressure lid. The safety-pin cord is used to remove the safety pin after the mine has been laid. There are two wooden spacer blocks on either side of the pull fuze 35 which serve to hold the fuze and a 0.44-pound main charge in place. When the mine is armed it is 7 inches long, 4 3/4 inches wide, and 5 inches high.

*b. Employment.* This mine is laid along paths, trails, road shoulders, approaches to likely fords across rivers and streams, and in antitank mine fields. It may be laid unburied in grass or wooded areas and covered with leaves or other vegetation.

*c. Functioning.* Pressure of 15 pounds on the pressure lid forces the sloped front of the pressure lid against the nail, pushing the striker



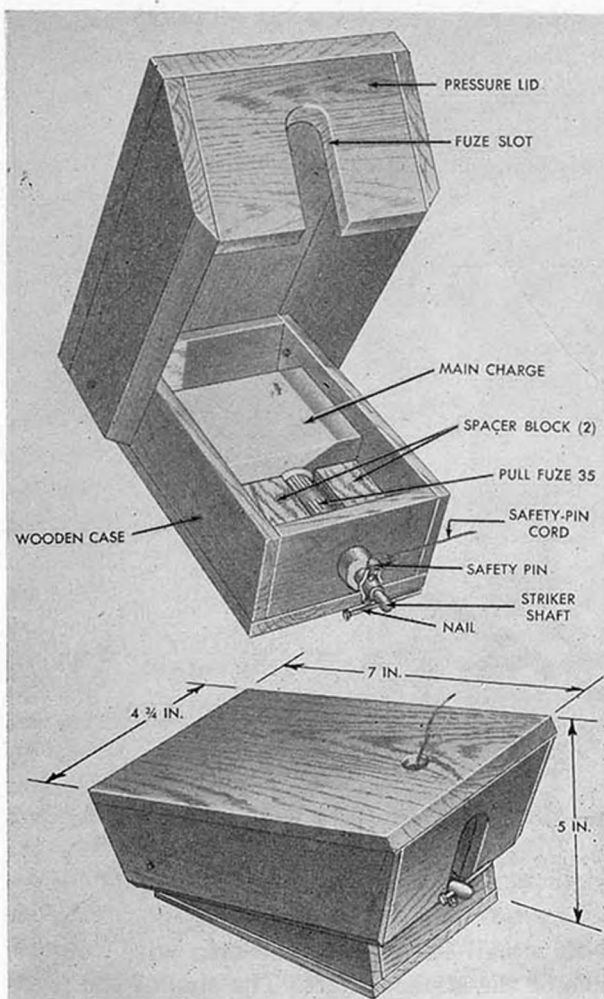


Figure 112. Schü'mine 44.

shaft outward until the spring-loaded striker is released against the percussion cap, firing the mine.

#### d. Installing and Arming.

- (1) Place the 0.44-pound main charge in the mine and screw a pull fuze 35, with detonator, into the main charge through the hole in the end of the mine.
- (2) Insert a nail in the trip wire (outer) hole in the striker shaft and lead the safety-pin cord up through the hole in the pressure lid.
- (3) Lower the pressure lid so the lower part of the front of the pressure lid rests against the nail, which is in a horizontal position.

- (4) Remove the nut on the end of the safety pin.
- (5) With the safety-pin cord, pull the safety pin through the hole in the pressure lid.

#### e. Neutralizing.

- (1) Carefully lift the pressure lid without applying a downward pressure and remove the nail.
- (2) Insert the nail in the safety-pin hole of the fuze.
- (3) Unscrew the fuze.
- (4) Remove the detonator from the fuze.

## 94. 400-Gram Schü'mine

a. *Description.* The antipersonnel 400-gram Schü'mine (fig. 113) differs from the previous models by being larger, containing more explosives, having the fuze entirely inside the wooden mine case, and by requiring the bending of a nail to actuate the fuze. The mine is  $8\frac{3}{4}$  inches long,  $3\frac{3}{4}$  inches wide, and  $4\frac{1}{2}$  inches high. The main charge, consisting of two 200-gram charges (0.88 pound), is placed in the back of the mine case. A wooden fuze-support block is located between the main charge and a wooden pressure block nailed to the under side of the pressure lid. A pull fuze 42 (par. 42) projects from the fuze-support block so the fuze slot in the pressure block fits over the striker shaft of the fuze. A small nail inserted through the front end of the pressure lid and mine case acts as the actuating pin and a larger nail, near the small nail acts as a safety pin. Two other nails at the opposite end of the pressure lid act as hinges. This mine is very similar to the Soviet Ovtinnikov mine (TM 5-223A).

b. *Employment.* This mine is laid along paths, trails, road shoulders, approaches to likely fords across rivers and streams, and in antitank mine fields. It may be laid unburied in grass or wooded areas and covered with leaves or other vegetation.

c. *Functioning.* Pressure of 100 pounds, or more, on the pressure lid bends down the actuating pin, lowering the pressure lid and pressure block so the latter forces the striker-retaining pin out of the fuze, releasing the spring-loaded striker against the percussion cap and firing the mine.

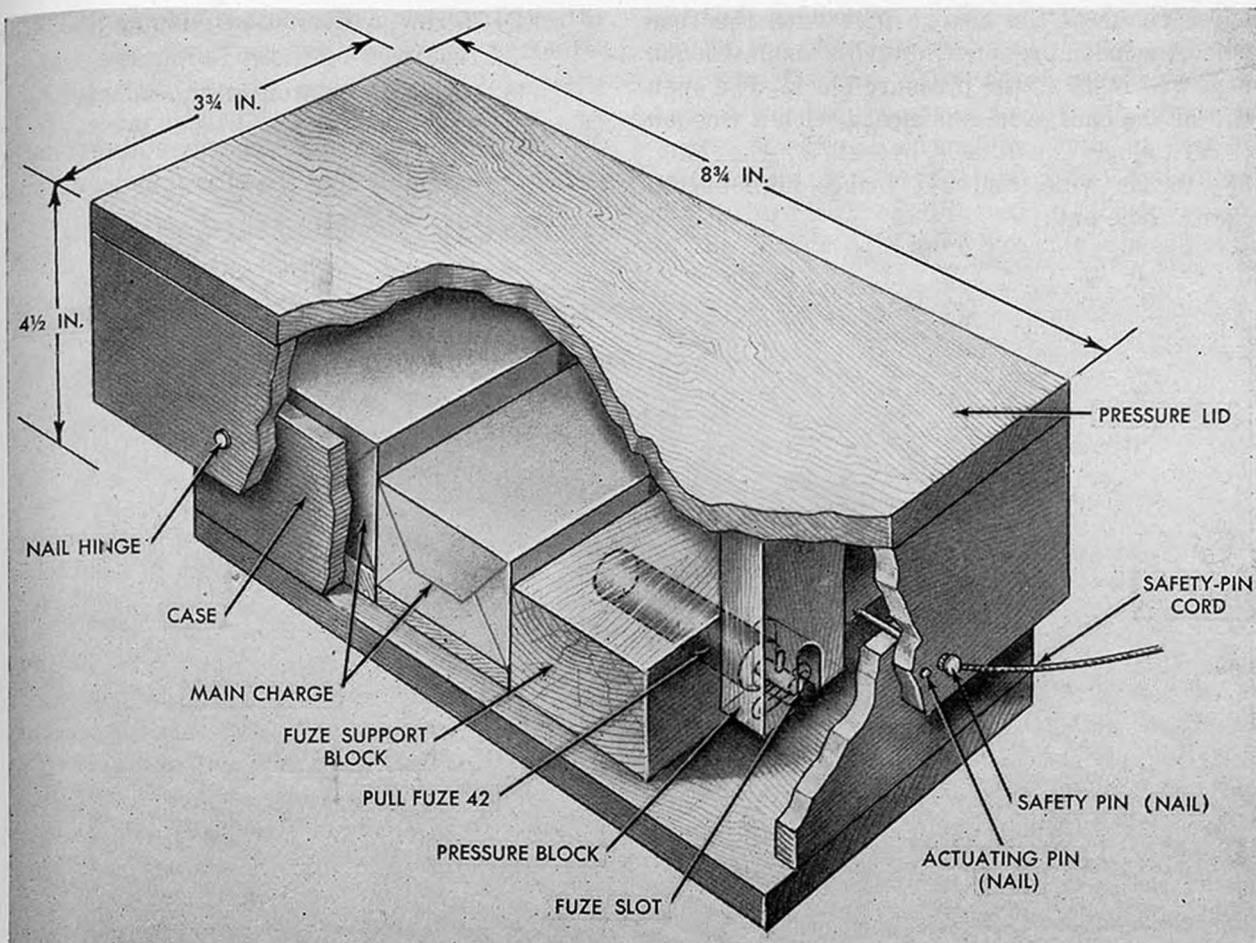


Figure 113. 400-Gram Schu' mine.

*d. Installing and Arming.*

- (1) Insert a pull fuze 42, with detonator, through the fuze-support block and screw it into the fuze well of one of the two 200-gram charges.
- (2) Position the striker-retaining pin of the fuze so its wings are below the striker shaft and so the fuze slot of the pressure block is directly above the wings.
- (3) Lower the pressure lid until the safety pin rests on the mine case.
- (4) Push a small nail through the small hole near the safety-pin nail.
- (5) Remove the safety-pin nail.

*e. Neutralizing.*

- (1) Carefully extract the small nail and, as it clears the end of the mine case, lift the pressure lid.

- (2) Unscrew the fuze.

- (3) Remove the detonator from the fuze.

## 95. Wooden-Block Mine, Type A

*a. Description.* The antipersonnel wooden-block mine, type A (fig. 114) consists of a rectangular block of wood, 7 inches long and approximately 2 inches square. A charge hole to accommodate the main charge, which is a standard German cylindrical 100-gram (0.22 pound) demolition charge, is bored lengthwise approximately two-thirds of the way through the center of the block. At the solid end of the block, a fuze hole is bored part of the way from the top of the block to take two chemical vials and a wooden pressure block. The top of the fuze hole is larger than the bottom. A cardboard disk rests on the ridge and supports the pressure block. A small hole to accommodate a deto-

nator connects the charge hole with the fuze hole. A wooden pressure lid pivots about wooden pegs and rests on the pressure block. The open end of the charge hole is closed with a wooden or cork plug. The mine is, overall, 8 inches long, 2½ inches wide, and 2¼ inches high at the charge hole end.

- (2) Screw a detonator adapter into the fuze well of the main charge and insert a detonator in the adapter.
- (3) Push the main-charge-and-detonator assembly into the charge hole, detonator end first.

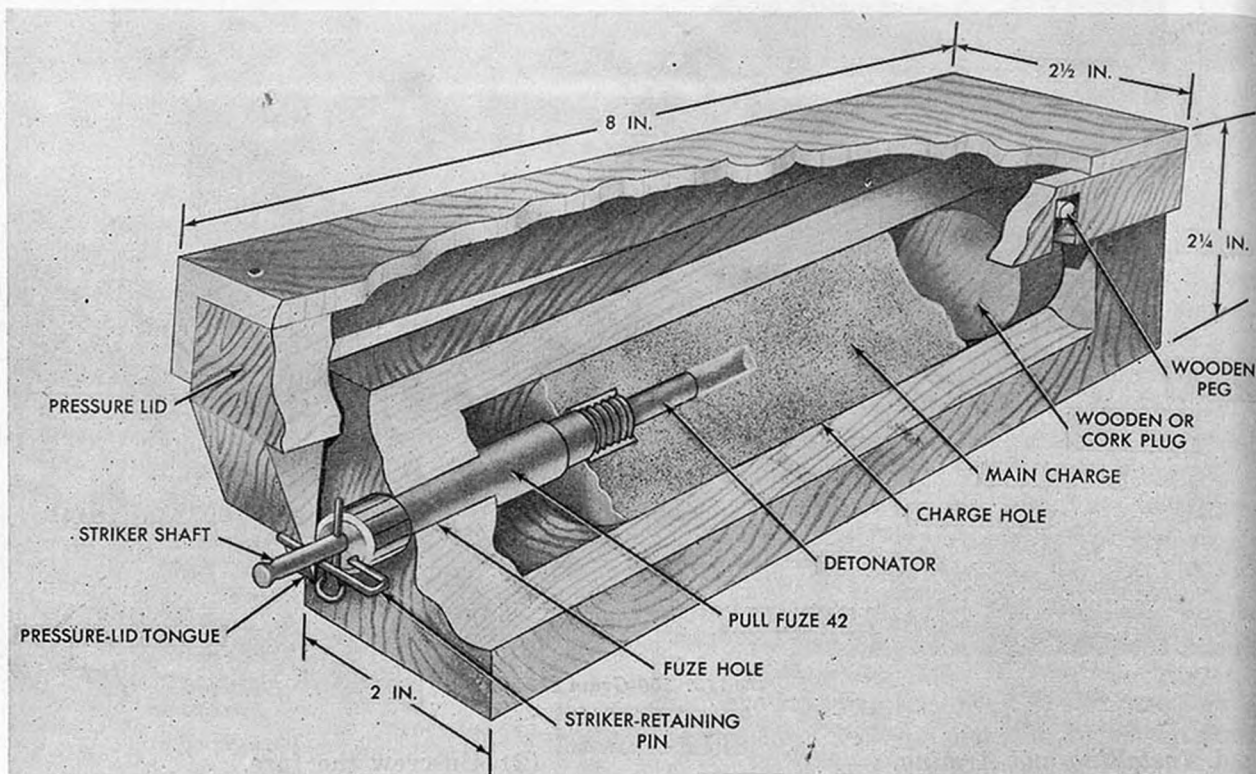


Figure 114. Wooden-block mine, type A.

*b. Employment.* This mine is laid along paths, trails, road shoulders, approaches to likely fords across rivers and streams, and in antitank mine fields. It may be laid unburied in grass or wooded areas and covered with leaves or other vegetation.

*c. Functioning.* A pressure of approximately 10 pounds on the pressure lid forces the pressure block through the cardboard disk and crushes the two chemical vials, producing a flame which fires the detonator and the main charge.

*d. Installing and Arming.*

- (1) Remove the wooden or cork plug from the charge hole.

- (4) Close the charge hole with the wooden or cork plug.
- (5) Insert the two chemical vials into the fuze hole.
- (6) Place the cardboard disk on the ridge in the fuze hole.
- (7) Carefully rest the pressure block on the cardboard disk.
- (8) Lay the mine in firm ground with the fuze end away from the enemy.
- (9) Gently lower the pressure lid so it rests on the pressure block.

*e. Neutralizing.*

- (1) Check for and neutralize any activating fuzes.



- (2) Carefully raise the pressure lid without exerting any downward pressure.
- (3) Lift out the pressure block and the cardboard disk.
- (4) Carefully remove the two chemical vials.
- (5) Remove the wooden or cork plug from the charge hole.
- (6) Tip the mine so the main-charge-and-detonator assembly slides out.
- (7) Remove the detonator from the main charge.

## 96. Wooden-Block Mine, Type B

*a. Description.* The antipersonnel wooden-block mine, type B (fig. 115) is similar to the type A except for the fuze and the pressure lid. The mine is 8 inches long,  $2\frac{1}{2}$  inches wide, and  $2\frac{1}{4}$  inches high. A charge hole to accommodate the main charge, which is a standard German cylindrical 100-gram (0.22 pound) demolition charge, is bored lengthwise about 6 inches

through the center of the block. At the other end of the block a fuze hole to accommodate a pull fuze 42 (par. 42) is bored into the charge hole. A wooden pressure lid pivots about wooden pegs and rests on the wings of the striker-retaining pin of the fuze and has two tongues that protrude through the wings. The open end of the charge hole is closed with a wooden or cork plug.

*b. Employment.* This mine is laid along paths, trails, road shoulders, approaches to likely fords across rivers and streams, and in antitank mine fields. It may be laid unburied in grass or wooded areas and covered with leaves or other vegetation.

*c. Functioning.* A pressure of from 6 to 11 pounds on the pressure lid pushes the striker-retaining pin out of the fuze, releasing the spring-loaded striker against the percussion cap and firing the mine.

*d. Installing and Arming.*

- (1) Push the main charge into the charge hole.

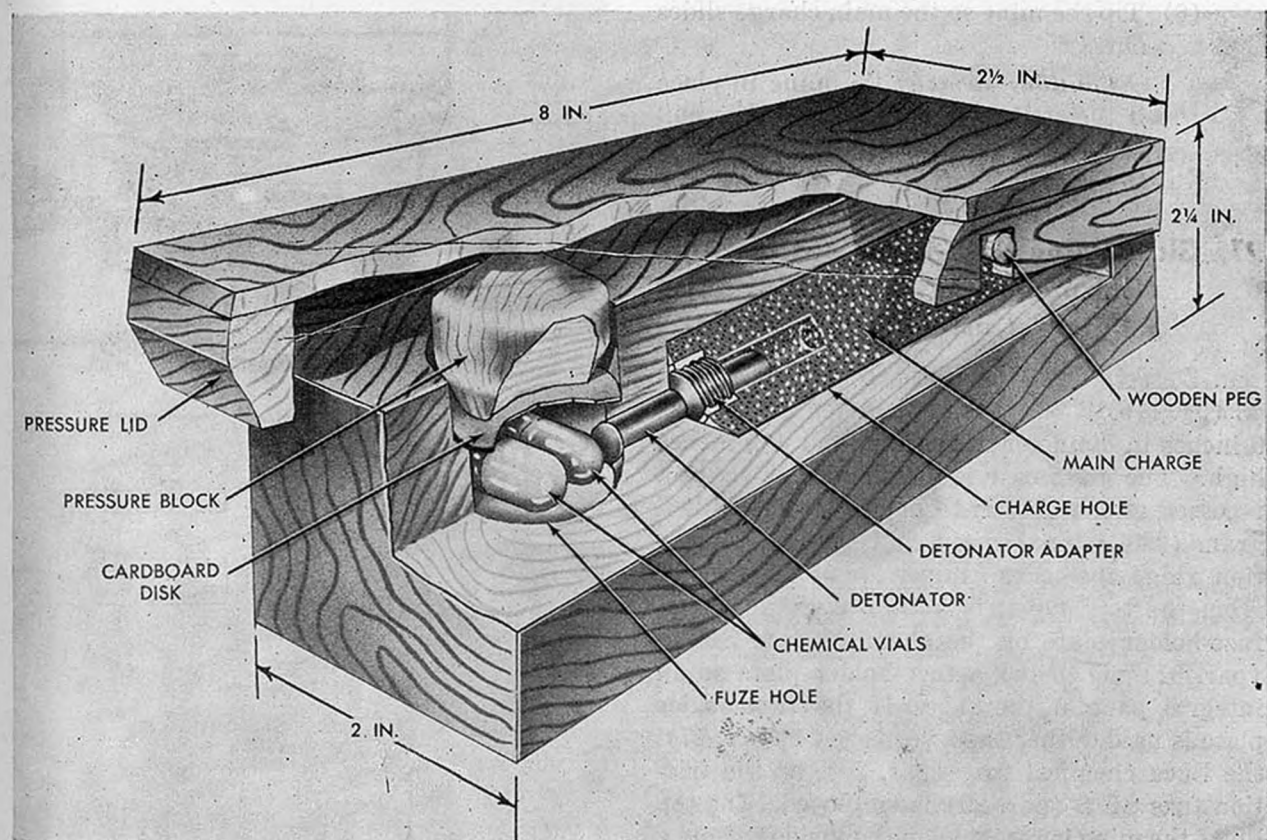


Figure 115. Wooden-block mine, type B.

- (2) Close the charge hole with a wooden or cork plug.
- (3) Screw the pull fuze 42, with detonator, into the main charge through the fuze hole. The wings of the striker-retaining pin should be horizontal and below the striker shaft.
- (4) Place the mine in the ground with the fuze end away from the enemy.
- (5) Gently lower the pressure lid so it rests on the wings of the striker-retaining pin of the fuze with the two tongues of the pressure lid protruding through the wings.

*e. Neutralizing.*

- (1) Check for and neutralize any activating fuzes.
- (2) Raise the pressure lid.
- (3) Unscrew the fuze and detonator from the main charge.
- (4) Remove the detonator from the fuze.
- (5) Remove the wooden or cork plug from the charge hole.
- (6) Tip the mine so the main charge slides out.

**Caution:** Destroy the mine in place if the striker-retaining pin of the pull fuze 42 is partially withdrawn from the striker shaft.

## 97. Glass Mine 43; Also Coastal Mine (Glasmine 43; Gl.Mi. 43; Also Schützen-Küstenmine; S.Kst. Mi.)

*a. Description.* This antipersonnel glass mine 43 (fig. 116) is 5 inches in diameter at the base, 6 inches in diameter at the top, and  $4\frac{1}{8}$  inches high. The glass case is deep and dish-shaped, recessed at the bottom to hold a standard 200-gram (0.44 pound) main charge. The midsection ridge inside the mine, about  $1\frac{3}{4}$  inches from the top, supports a thin, circular, metal fuze-holder plate or the chemical fuze SF 18 (par. 31) which has a fuze-holder plate as an integral part of the fuze. If the fuze-holder plate is used, either the lever fuze 44 (par. 27), the Buck chemical fuze (par. 28), or the friction fuze SF 6 (par. 29) is employed. The top lip of the mine is recessed on the inside to hold a thin glass shear plate, which may be sealed in

place with putty, glue, or coal tar to waterproof the mine. A thick glass pressure plate is glued to the top of the glass shear plate. There are two longitudinal grooves in the bottom of the glass pressure plate so a wire safety device may be inserted to prevent premature crushing of the glass shear plate. In some cases wooden sticks were used for this purpose. The Germans originally called this mine the *Glasmine 43* but late in World War II changed the name to *Schützen-Küstenmine* (antipersonnel coastal mine).

*b. Employment.*

- (1) *On land.* As the glass mine 43, this mine was laid as an antipersonnel mine, buried in the ground and covered with about an inch of soil or surrounding material, and fitted with either the lever fuze SM 4 or the Buck chemical fuze.
- (2) *Underwater.* The Germans intended that the glass mine 43 should be desig-

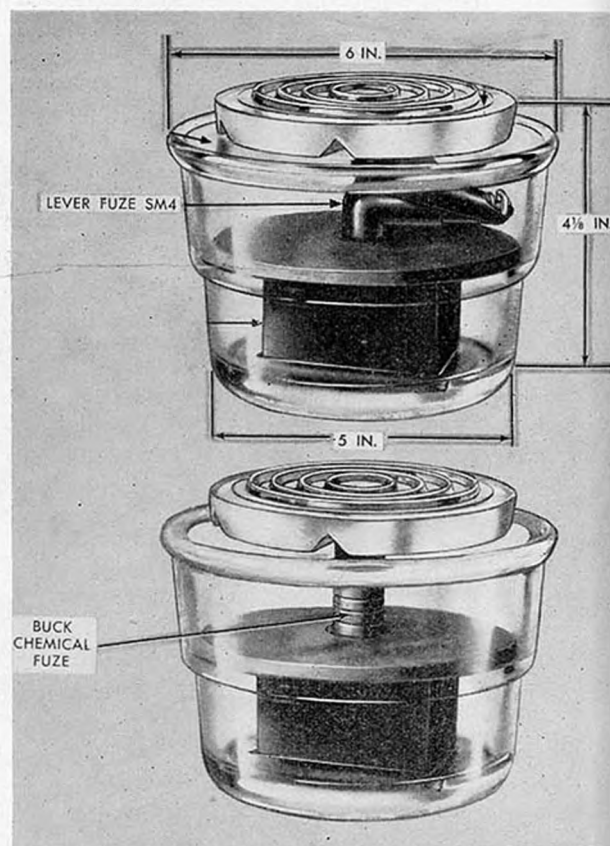


Figure 116. Glass mine 43 or coastal mine.

nated the antipersonnel coastal mine (Schützen-Küstenmine) to be used as an underwater antipersonnel mine on beaches and likely river-crossing points. The friction fuze SF 6 and the chemical fuze SF 18 were designed for this mine when so employed.

*c. Functioning.* A pressure of about 25 pounds on the glass pressure plate breaks the glass shear plate and actuates the fuze, setting off the detonator and the main charge.

*d. Installing and Arming.*

- (1) Place a 200-gram (0.44 pound) charge (for the lever fuze SM 4 or the Buck chemical fuze) or a cardboard

box with 150 grams (0.33 pound) of powdered explosive (for the friction fuze SF 6 or the chemical fuze SF 18) in the bottom of the glass case with the fuze well up.

- (2) Glue the metal fuze-holder plate, or an SF 18 fuze with detonator and attached fuze-holder plate onto the mid-section ridge.
- (3) Screw an assembled lever fuze SM 4 or Buck chemical fuze, with detonator, into the fuze well of the 200-gram charge, or insert the friction fuze SF 6, with detonator, into a hole punched with a piece of wood in the 150-gram

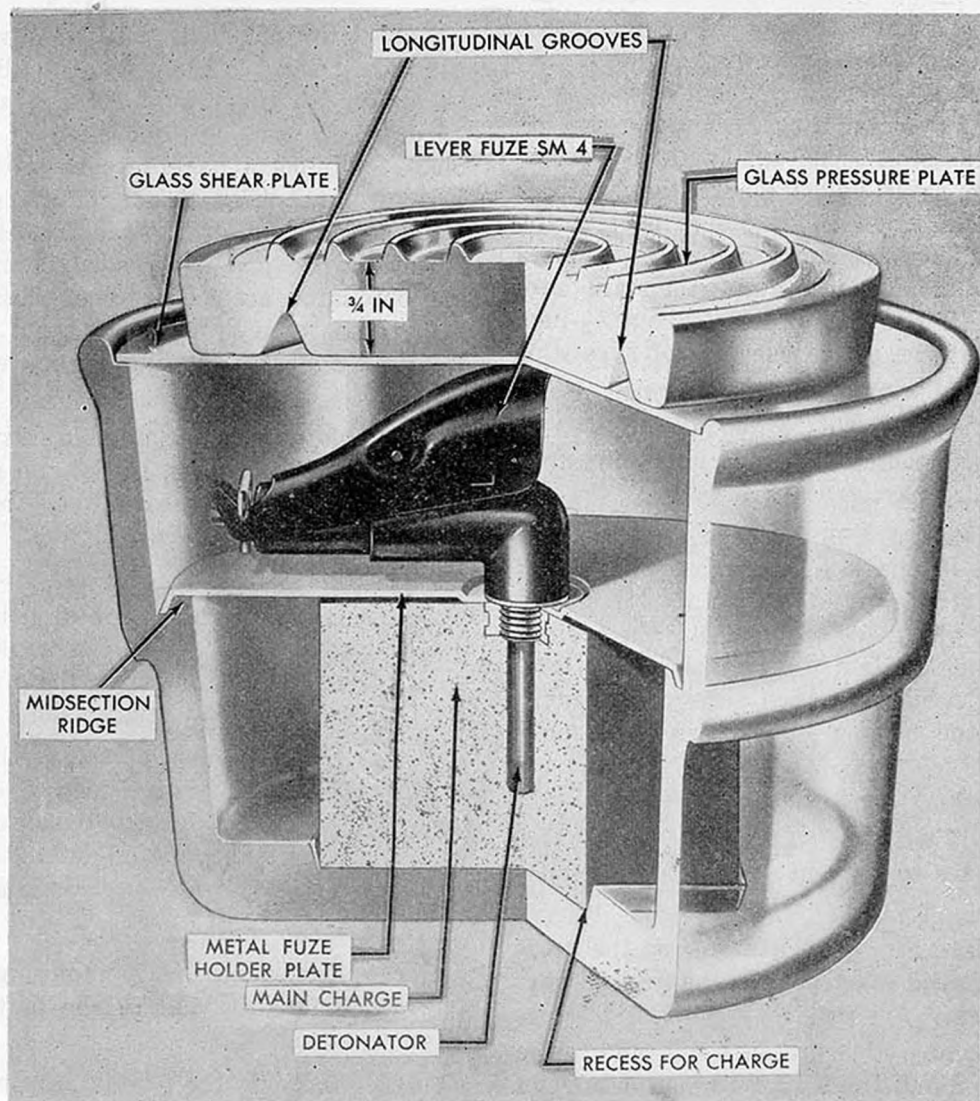


Figure 116—Continued.



charge. Remove the safety pin of the lever fuze SM 4.

- (4) Glue the glass pressure plate to the glass shear plate and glue them to the mine case. Be sure the joint is well waterproofed.

*e. Neutralizing.* Do not hand-neutralize these mines; blow them in place with a prepared charge.

*f. Packing.* These mines were at first packed 5 to a cardboard box and later were packed 10 to a crate made of wooden slats.

## 98. Antipersonnel Clay Mine

*a. Description.* The antipersonnel clay mine (fig. 117) consists of a cylindrical, baked-clay case with a flat stucco-like pressure lid. It is 8 inches in diameter and 3 inches high, and weighs 4 pounds, including about 3 pounds of explosive and a cylindrical booster charge. Four pull fuzes 42 (par. 42), with detonators attached, are set in hollow horizontal chambers at 90° to each other in the lower part of the pressure lid. These chambers lead to a central ignition chamber which contains the main detonator. The lid has four holes of about 1/2-inch diameter in the top for insertion of sprays of leaves or grass to aid in camouflaging the mine.

*b. Employment.* This mine is employed in antitank mine fields to hinder reconnaissance and breaching parties.

*c. Functioning.* A pressure of 40 pounds on the pressure lid shears off the rim of the lid and pushes the striker-retaining pin out of one or more of the pull fuzes 42, releasing the spring-loaded striker against the percussion cap and firing the detonator, which sets off the main detonator, the booster charge, and the main charge.

*d. Installing and Arming.* These mines should be laid with a distance of at least 3 feet between mines to prevent sympathetic detonation.

- (1) Place the mine in a hole so the pressure lid is even with the ground surface.
- (2) Remove the pressure lid and place four pull fuzes 42, with detonators, in the fuze wells in the pressure lid so

the wings of the striker-retaining pins are above the striker shaft.

- (3) Place the main detonator in the hole in the booster charge.
- (4) Position the pressure lid on the mine so the fuzes coincide with the four slots in the rim of the clay case.

*e. Neutralizing.*

- (1) Lift the pressure lid *vertically*, with care.
- (2) Remove the pull fuzes and their detonators.
- (3) Remove the main detonator.

## 99. Plastic-Can Mine, (Schützendosenmine Kunststoff; Schu. D.Mi. K.)

*a. Description.* The antipersonnel plastic-can mine (fig. 118) is a copy of the British tire-burster or "ointment box" mine. It is 2 3/8 inches in diameter and 1 5/8 inches high. A small, black, cylindrical bakelite case with an overlapping lid houses a doughnut-shaped main charge, a built-in spring-loaded striker held by a shear wire, and a threaded percussion-cap-and-detonator assembly. The pressure lid is held to the case by adhesive tape. This mine weighs 4 ounces, including 2.5 ounces of explosive.

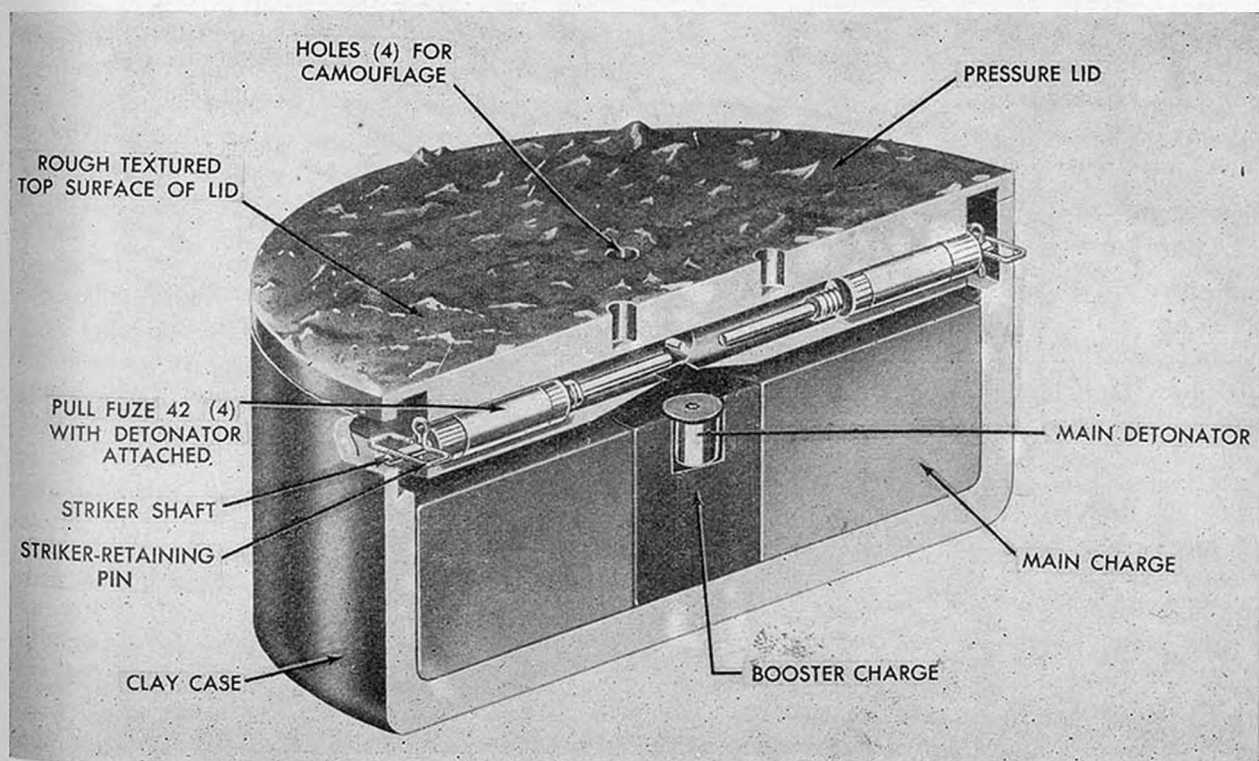
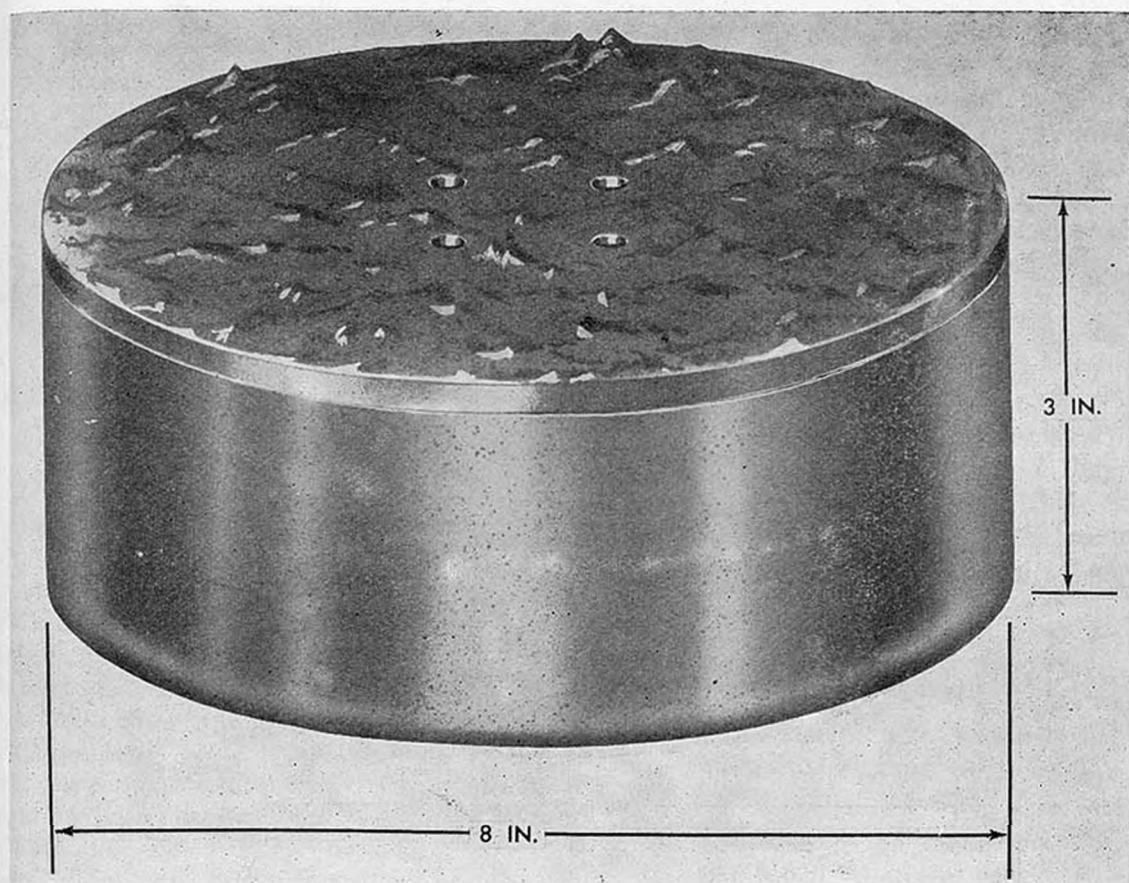
*b. Employment.* This mine is scattered along airfield runways, paths, roads, and road shoulders to injure personnel and to destroy the tires of vehicles and aircraft.

*c. Functioning.*

- (1) Pressure on the top or bottom of the mine compresses the striker spring, causing it to bear on the pressure disk in the hollow striker shaft.
- (2) Further pressure causes the pressure disk to shear the shear wire, releasing the spring-loaded striker against the percussion-cap-and-detonator assembly and firing the main charge.

*d. Installing and Arming.*

- (1) Remove the shipping plug from the detonator well in the bottom of the mine.
- (2) Screw in the percussion-cap-and-detonator assembly.



*Figure 117. Antipersonnel clay mine.*

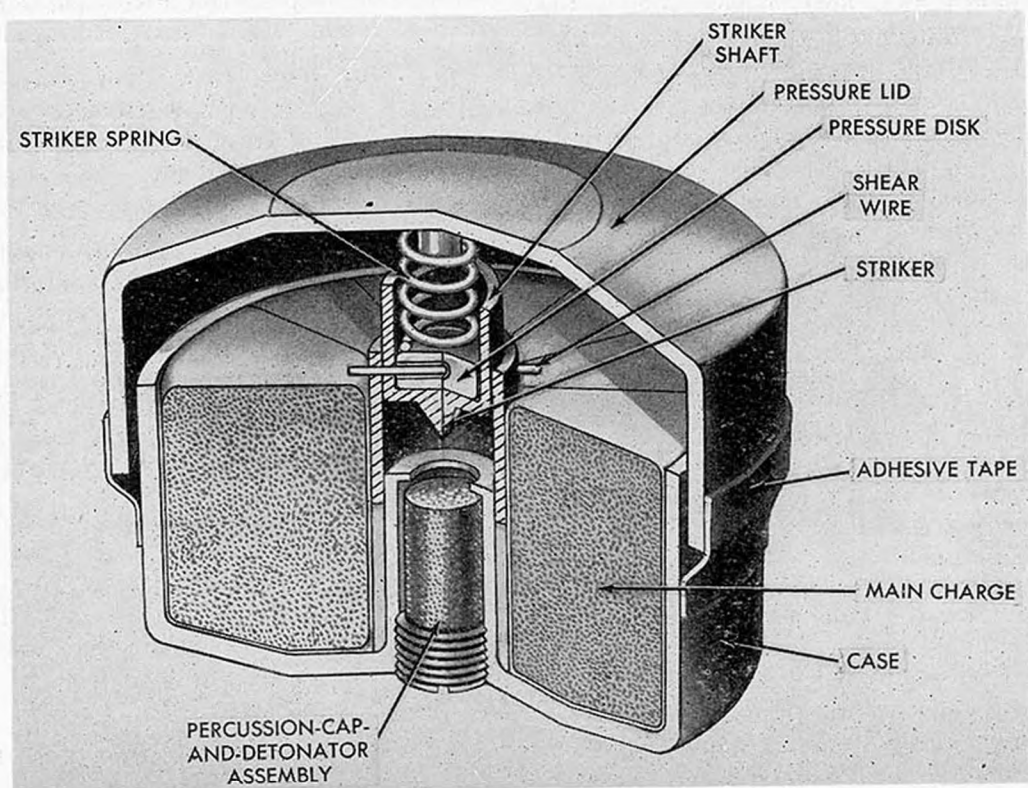
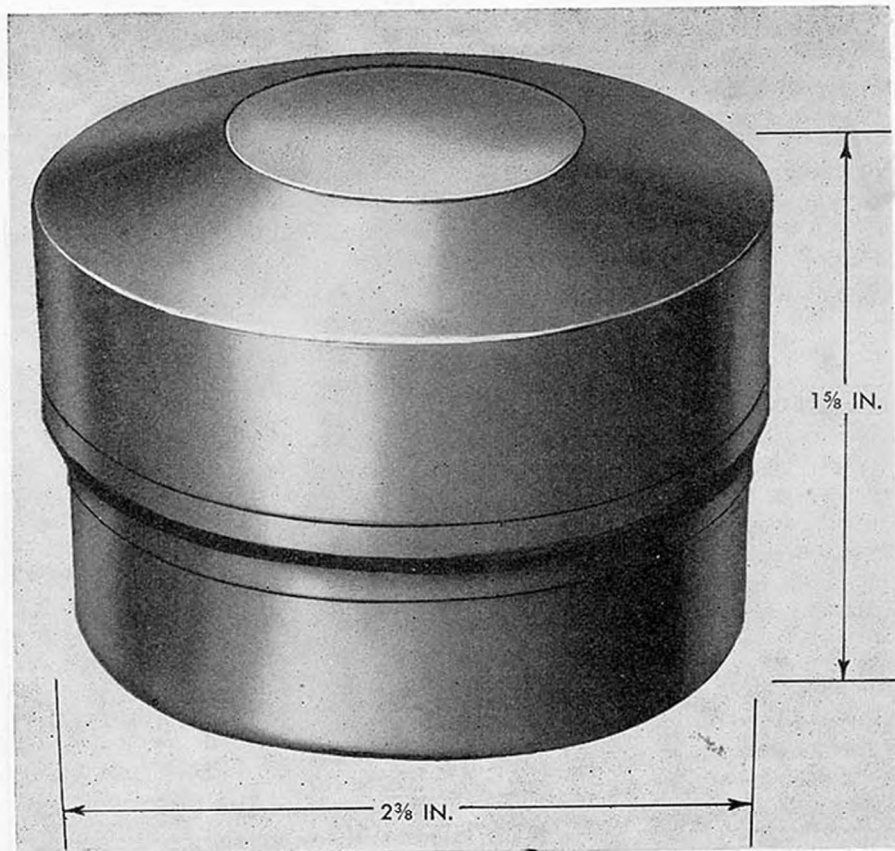


Figure 118. Plastic-can mine.



- (3) Place the mine on the ground or in a hole with the pressure lid slightly above ground level.

*e. Neutralizing.* Unscrew the percussion-cap-and-detonator assembly being careful not to exert any pressure on the pressure lid.

*f. Packing.* Two hundred of these mines are packed in a zinc-lined wooden box with a descriptive label on the lid.

### 100. Bounding Gas Mine 37 (Sprühbuchse 37; Sp. Bü. 37)

*a. Description.* The antipersonnel bounding gas mine 37 (fig. 119) closely resembles a large S-mine (par. 85) in external appearance and is very similar to the Soviet bounding gas mine KhF-1 (TM 5-223A). A cylindrical steel case 7 inches in diameter and 16 inches high, fitted with a handle of wood and wire, houses a cylindrical metal mine unit which contains about 2 gallons of liquid contaminant (usually mustard). A central ignition tube welded to the bottom of the mine unit contains a main charge for bursting the mine, a detonator, and a wooden plug with a delay pellet. A base plug is threaded internally to receive the bowl-shaped propelling charge consisting of 300 grams (0.66 pounds) of black powder in a metal case. A filler plug is centrally located in the top of the mine and a flash tube projects above the top of the mine and ends in a horizontal and a vertical fuze well, both internally threaded to receive the fuze. The bottom of the flash tube leads into the propelling charge. The fuze used with this mine is the 5-minute clockwork delay fuze (par. 56). The letters *Sp. Bü. 37* are stencilled in white on the side of the steel case and two yellow bands are painted on the upper portion of the mine unit. All points where leakage might occur are painted with a pink contaminant-detector varnish which turns red when contacted by gas.

*b. Employment.* This mine is employed to deny various areas to opposing forces by contaminating the areas with gas. The mine may be laid to give either an air burst or a ground burst. One mine will contaminate an area of 180 square yards in a ground burst and up to 600 square yards in an air burst.

#### *c. Functioning.*

- (1) *Air burst.* The 5-minute clockwork delay fuze ignites the propelling charge, propelling the mine unit out of the steel case 10 to 20 feet into the air before the delay pellet (0.4 second) sets off the detonator and the main charge. The explosion bursts the mine unit, spreading contaminant over an area of 360 to 600 square yards.
- (2) *Ground burst.* The 5-minute clockwork delay fuze, screwed into the base plug sets off the detonator and the main charge. The explosion bursts the mine unit, spreading contaminant over an area of about 180 square yards.

#### *d. Installing and Arming.*

##### (1) *For air burst.*

- (a) Place the mine in a hole so a fourth of the mine will be above the ground.
- (b) Loosen the turned-over lip at the top of the steel case with a screw driver or pair of pliers.
- (c) Wind the 5-minute clockwork delay fuze with the winding key and set the dial at the desired number of minutes delay. Do not set the fuze for a delay of less than 2 minutes.
- (d) Screw the 5-minute clockwork delay fuze into one of the fuze wells.
- (e) Remove the safety-pin retaining wire and pull the safety pin out of the fuze. This starts the mechanism. If the fuze is a type III, 5-minute clockwork delay fuze, set the arming knob at *scharf*.

##### (2) *For ground burst.*

- (a) Remove the mine unit from the steel case by loosening the turned-over lip at the top of the steel case with a screw driver or a pair of pliers.
- (b) Unscrew the propelling charge and the base plug and remove the delay pellet.

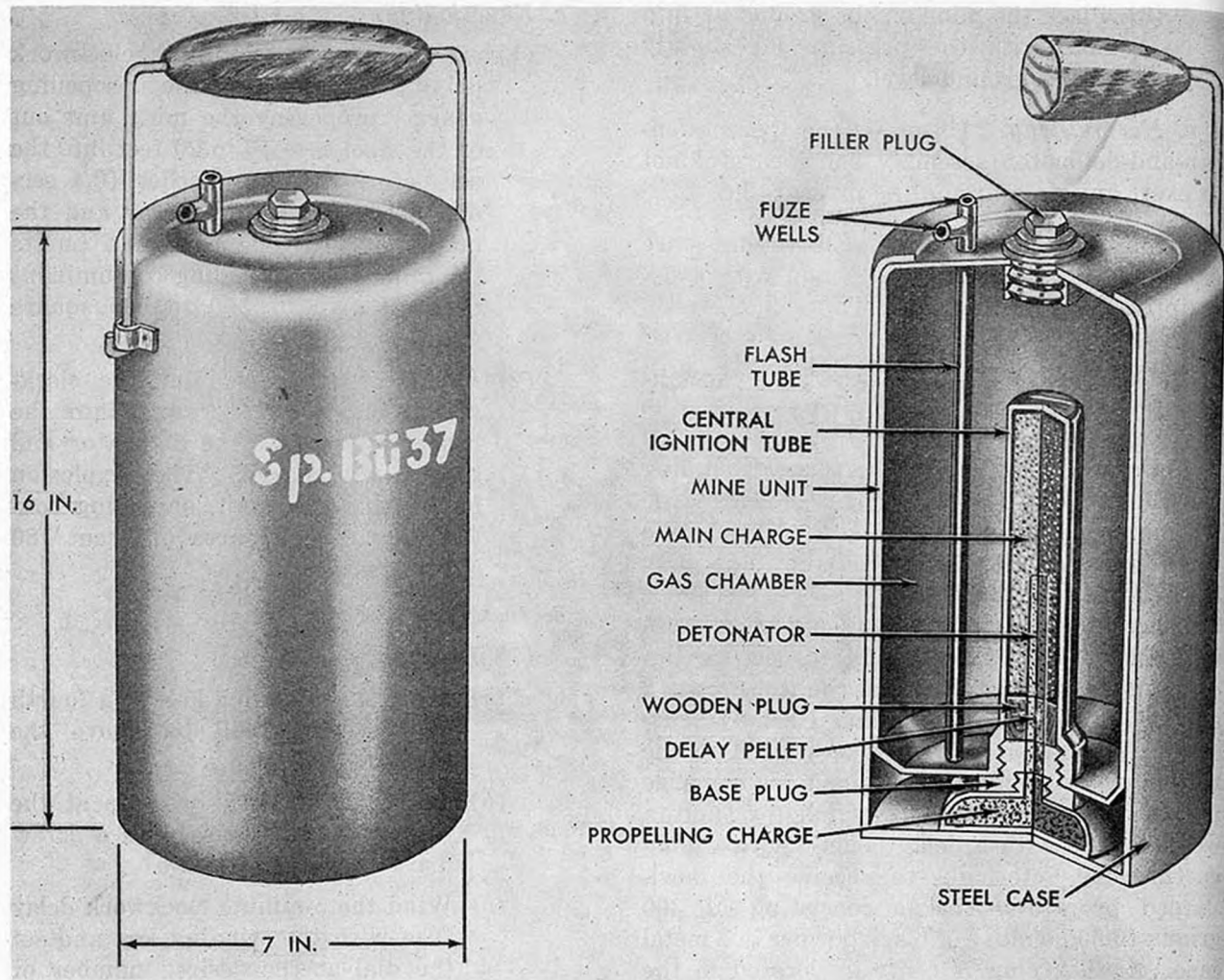


Figure 119. Bounding gas mine 37.

- (c) Replace the base plug and screw a 5-minute clockwork delay fuze into it.
- (d) Arm the 5-minute clockwork delay fuze the same way as it is armed for an air burst.
- (e) Place the mine unit on the ground.

*e. Neutralizing.* Insert a wire or nail in the safety-pin hole of the 5-minute clockwork delay fuze and unscrew it from the mine. If a type III 5-minute clockwork delay fuze has been used, turn the arming knob to *sicher*, insert a safety pin, and unscrew the fuze. In destroying these mines no more than five should be destroyed at one time. The mines are placed in a pit 3 feet deep. They are then covered with a 1-foot layer of decontaminant and then with a

1-foot layer of packed earth. The mines are destroyed by demolition charges. An area with a radius of 50 yards from the mines should be evacuated. An "unsafe area," bounded by two lines extending 2,000 yards down wind at a 30° angle from the direction of the wind, should be posted.

*Note.* Only in rare instances will the opportunity present itself to neutralize the mine.

#### 101. Ice Mine or Bottle Mine 42 (Flascheneismine 42; Fl. Es. Mi. 42; Also, Erschütterungsmine)

*a. Description.* The antipersonnel ice mine or bottle mine 42 (figs. 120 and 121) resembles a quart-size milk bottle. It has a thick-glass body, 10½ inches high and 4 inches in diam-

eter, filled with about 4 pounds of explosive. A booster charge is located in the neck of the bottle. A wooden plug fits into a recess inside the mouth. The wooden plug holds an impact fuze which has a detonator crimped to its base. An aluminum cap, waterproofed with sealing compound, screws on the top of the bottle over the fuze. A rubber waterproofing band fits over a portion of the aluminum cap and glass bottle. The impact fuze used in this mine is designed to function under the concussion of a nearby underwater explosion. An ice mine fitted with an electric fuze is used as the initiating mine to set off the explosion which detonates the nearest impact-fuzed ice mine. In the initiating mine, the aluminum cap covering the top of the mine has a built-in, threaded, central fuze well for insertion of the electric fuze. Sealing compound is placed around the electric fuze and aluminum cap. The S-mine fuze 35 (fig. 122) and the pull fuze 42 (fig. 123) are sometimes used in this mine.

#### b. Employment.

- (1) Although this mine was used by the Finnish Army in winter warfare to create water obstacles by blowing gaps in the ice on rivers and lakes (TM 5-223B), the German Army adopted it and employed it as an antipersonnel mine as shown in figures 122 and 123. The mine was originally designed to be left in the water under ice and be detonated by remote electrical control at the approach of personnel. Ice mines are normally laid in frozen rivers or lakes in rows or "fields." They are suspended through holes in the ice, 6 feet below the surface, by means of wires attached to wooden cross pieces placed over the holes (fig. 124). They are normally spaced about 16 feet apart.
- (2) The ice mine may also be encased in a block of concrete to add shrapnel effect for antipersonnel use. In this case, it may be fitted as shown in figure 125.

#### c. Functioning.

- (1) *Impact fuze.* When the initiating mine with the electric fuze detonates, the concussion travels through the

water to the nearest impact-fuzed mine, shearing the shear wire in the impact fuze and releasing the spring-loaded striker against the percussion cap, firing the impact-fuzed mine. The concussion from the detonation of the first impact-fuzed mine causes the next impact-fuzed mine to detonate and so on.

#### (2) S-mine fuze 35 (par. 25).

- (a) Pressure of 15 pounds on the pressure prongs overcomes the resistance in the plunger spring and depresses the plunger.
- (b) The two striker-retaining balls are forced outward, releasing the spring-loaded striker against the percussion cap and firing the mine.

#### (3) Pull fuze 42 (par. 42). This fuze functions by either pressure, pull, or tension release.

- (a) *Pressure.* Pressure of 6 to 11 pounds on the wings of the striker-retaining pin pushes the pin out of the striker shaft, releasing the spring-loaded striker against the percussion cap and firing the mine.
- (b) *Pull.* A pull of from 6 to 11 pounds on a trip wire attached to the loop in the striker-retaining pin pulls out the pin, releasing the spring-loaded striker against the percussion cap and firing the mine.
- (c) *Tension release.* Cutting or breaking a taut trip wire attached to the outer hole in the striker shaft releases the spring-loaded striker against the percussion cap and fires the mine.

#### d. Installing and Arming.

##### (1) Impact fuze.

- (a) Place the fuze and the attached detonator into the fuze well.
- (b) Screw on the aluminum cap and place the rubber waterproofing band as indicated in figure 120.
- (c) Place the mine in position.

##### (2) S-mine fuze 35.

- (a) Attach the fuze, with detonator, to the mine.



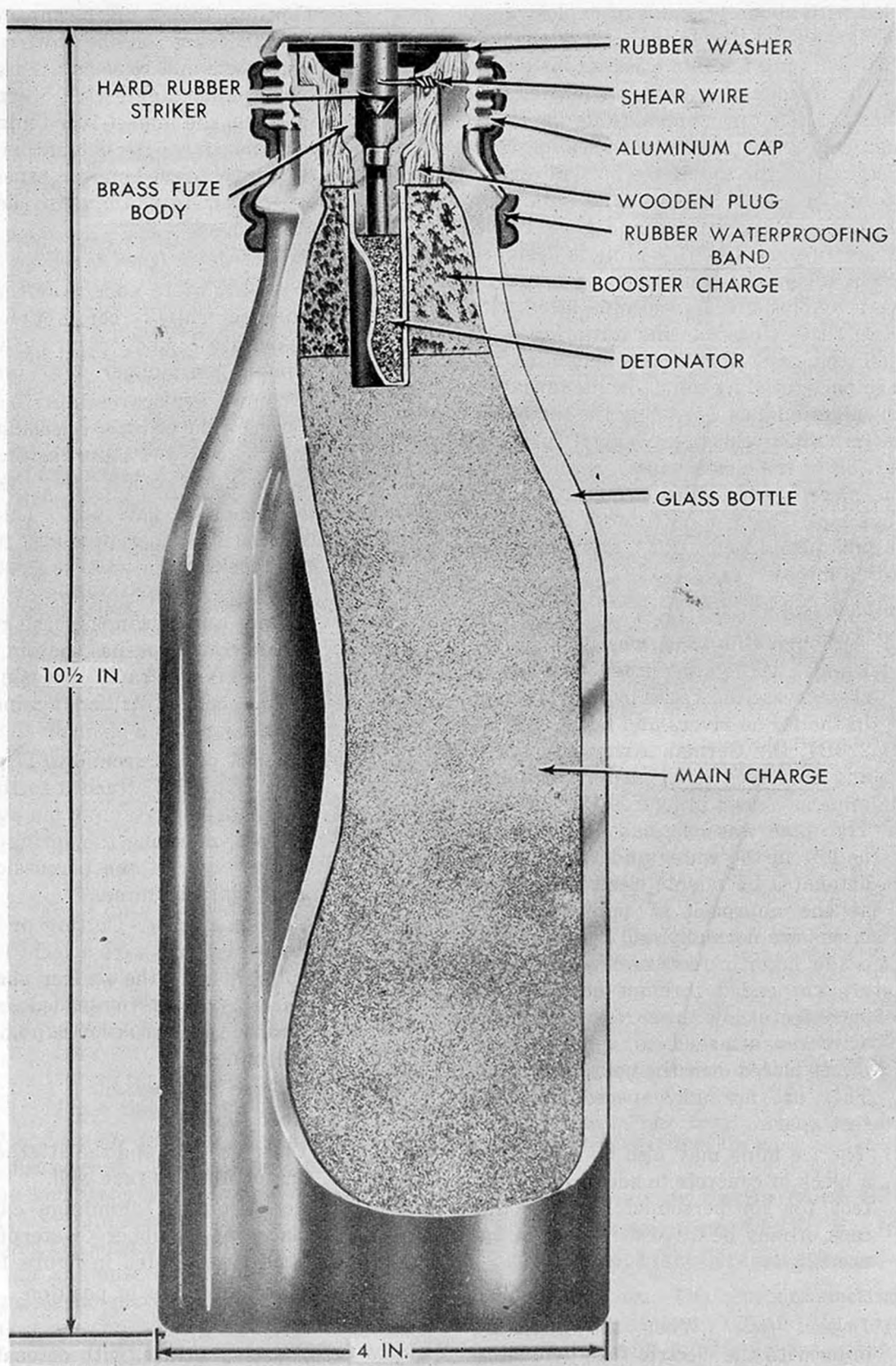


Figure 120. Ice mine or bottle mine 42.

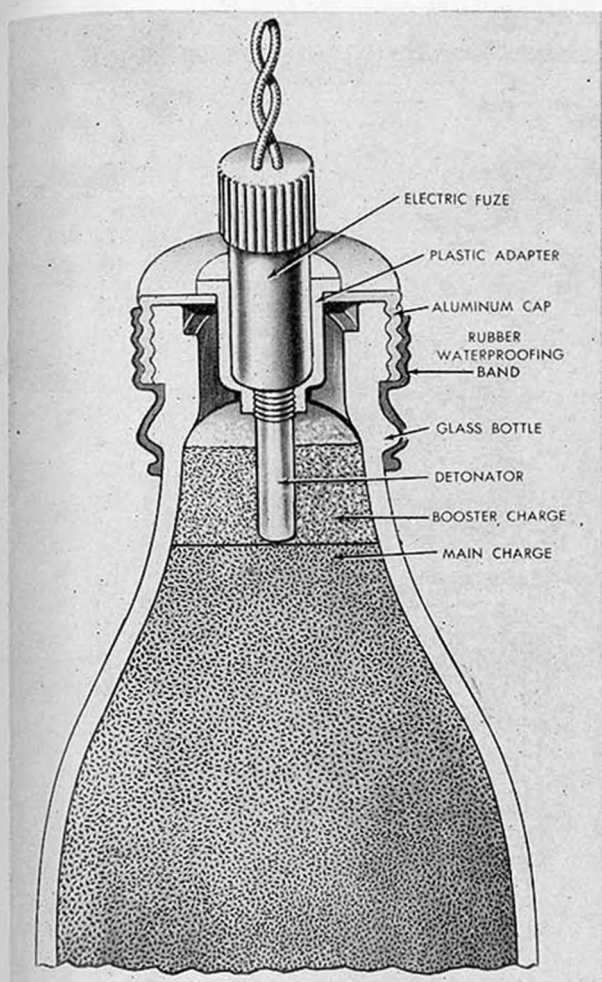


Figure 121. Initiating ice mine.

- (b) Place the mine in the ground with just the pressure prongs above ground.
- (c) Unscrew the retaining nut from the end of the safety pin and withdraw the safety pin.
- (3) *Pull fuze 42.*
  - (a) *Pressure.* Screw the fuze, with detonator, into the mine. Turn the striker shaft so the wings of the striker-retaining pin are below the striker shaft. This will permit the pin to be pushed out when pressure is applied.
  - (b) *Pull.* Attach a slack trip wire to the loop of the striker-retaining pin after the mine is laid, and fasten the other end of the trip wire to a stake or bush.

(c) *Tension release.* With the striker-retaining pin still in the striker shaft, attach a taut trip wire to a stake or bush and then to the trip wire hole in the striker shaft. Be sure the trip wire is taut. Remove the striker-retaining pin with rope or wire from a minimum distance of 50 yards.

e. *Neutralizing.*

(1) *Impact fuze.*

- (a) Pull the mine up through the hole in the ice.
- (b) Remove the rubber waterproofing band.
- (c) Unscrew the aluminum cap and lift out the fuze and detonator.
- (d) Remove the detonator from the fuze.

(2) *S-mine fuze 35.*

- (a) Insert a safety pin in the safety-pin hole.
- (b) Search for, investigate, and cut all slack trip wires connected to the striker-retaining pin.
- (c) Remove the fuze and detonator from the mine.
- (d) Remove the detonator from the fuze.

(3) *Pull fuze 42.*

- (a) *Pressure.* Unscrew the fuze and detonator from the mine and remove the detonator from the fuze.
- (b) *Pull.* Search for, investigate, and cut all slack trip wires connected to the striker-retaining pin; then unscrew the fuze and detonator from the mine and remove the detonator from the fuze.
- (c) *Tension release.* Insert a striker-retaining pin or a cotter pin in the innermost hole in the striker shaft; then cut the taut trip wire, after investigating the other end. Unscrew the fuze and detonator from the mine and remove the detonator from the fuze.

**Caution:** If the striker-retaining pin is not firmly seated in the striker shaft, the mine should be destroyed in place.

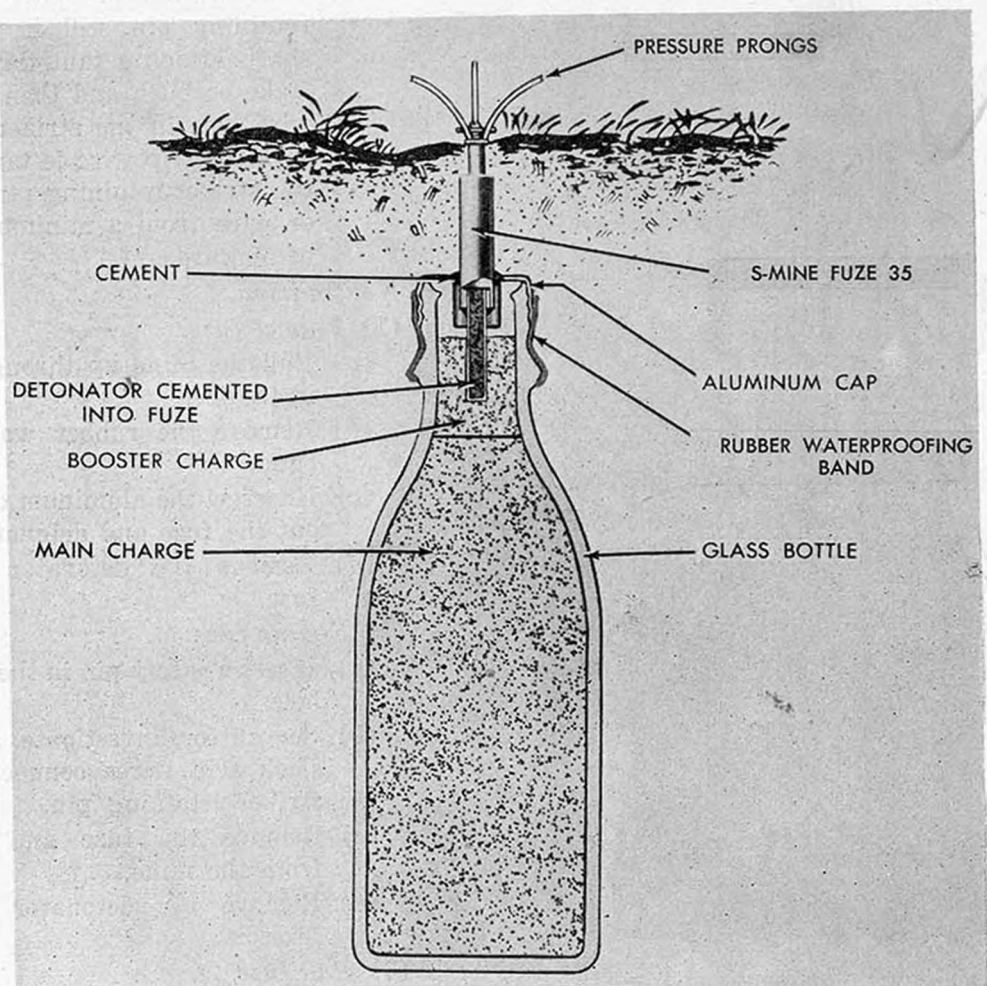


Figure 122. Ice mine fitted with S-mine fuze 35.

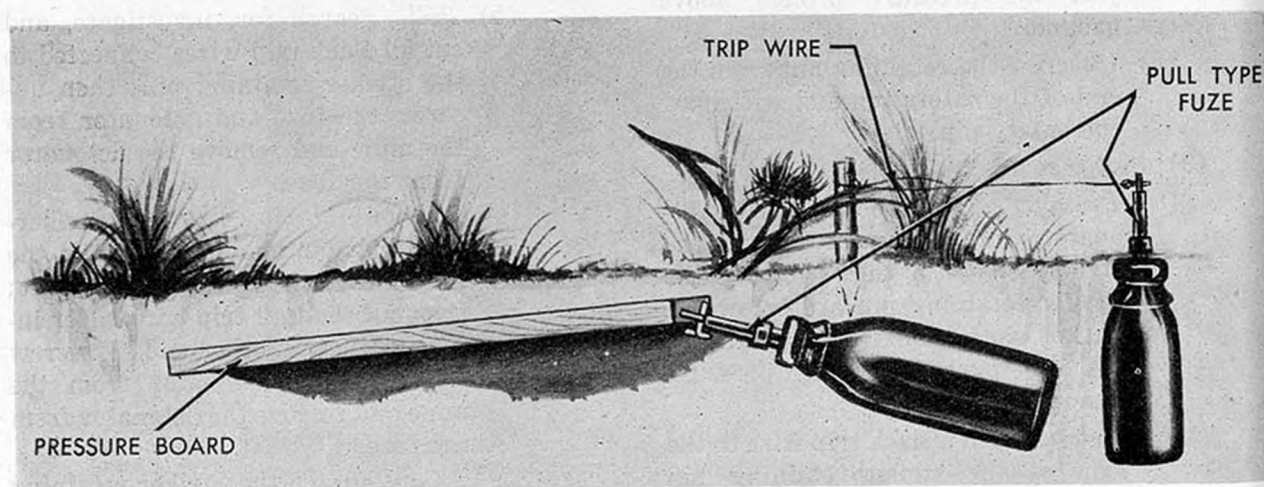


Figure 123. Ice mine fitted with pull fuze 42.



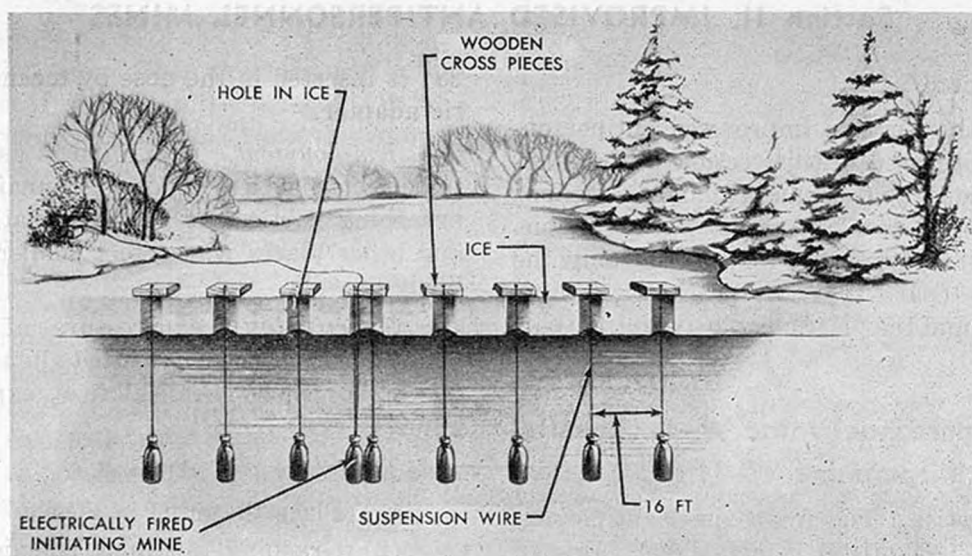


Figure 124. Row of ice mines under ice.

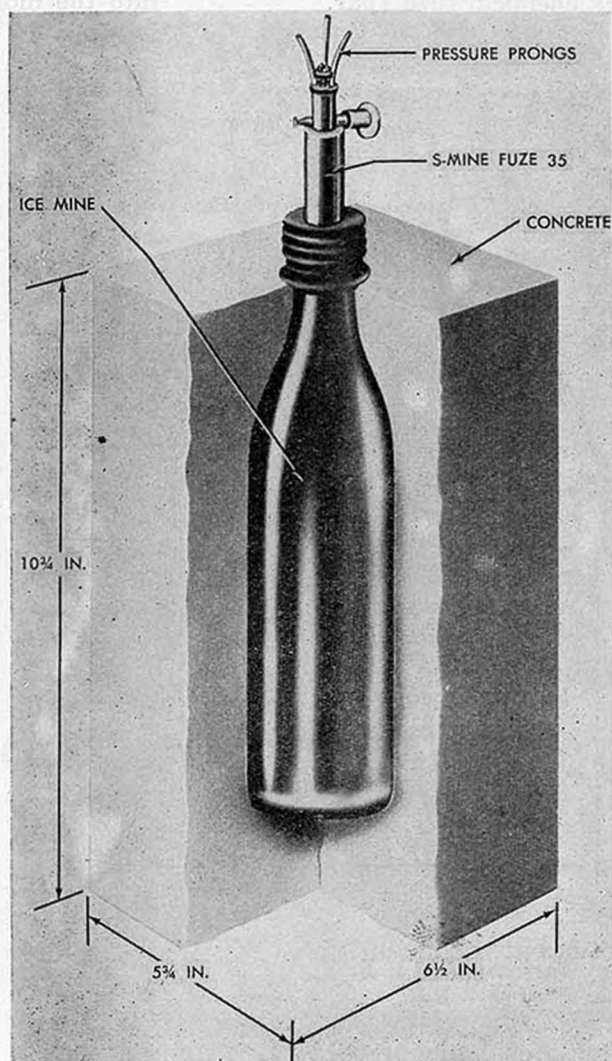


Figure 125. Ice mine encased in a block of concrete.

## Section II. IMPROVISED ANTIPERSONNEL MINES

### 102. General

Most of the German improvised antipersonnel mines discussed in this section were manufactured locally by German ordnance battalions using whatever local material was available. Combat units improvised in the field only the tread mine (par. 105), the ration-can mine (par. 106), and the plastic-explosive mine (par. 108).

### 103. Antipersonnel Mine W-1 (Behelfs-Schützenmine W-1)

*a. Description.* The improvised antipersonnel mine W-1 (fig. 126) is made from a French 50-mm mortar shell. The tail fins and the nose fuze are removed. A Buck chemical fuze (par.

28) is inserted in the nose by means of a plastic adapter.

*b. Employment.* This mine is used in anti-tank mine fields to hinder reconnaissance and breaching parties. It is laid in paths, ditches, and other places where foot soldiers are most likely to walk.

*c. Functioning.* A pressure of about 15 pounds crushes the corrugated aluminum cylinder of the Buck chemical fuze, exploding the mine.

*d. Installing and Arming.*

- (1) Place the mine in a hole.
- (2) Grasping the Buck chemical fuze as near to the base as possible, screw it into the mortar shell.

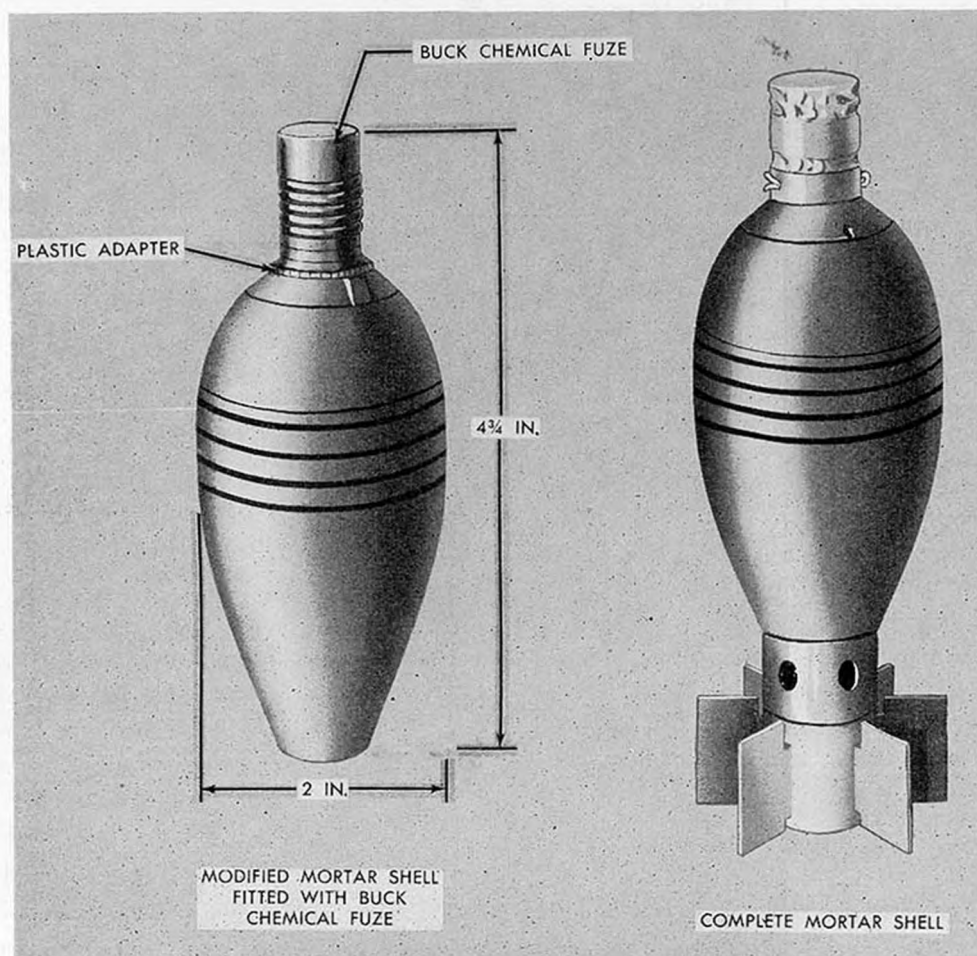


Figure 126. Improvised antipersonnel mine W-1.

e. *Neutralizing.*

- (1) *Detecting.* This mine is easily detected by any mine detector. If the probing method of mine location is used, be careful not to crush the aluminum cylinder of the fuze. If the cylinder is crushed or pierced, the mine explodes.
- (2) *Neutralizing.* This mine has no safety device.
  - (a) Remove the fuze by unscrewing the adapter from the mortar shell. Grasp the fuze as near to the base as possible in order not to crush the aluminum cylinder.
  - (b) Remove the detonator.

*Note.* If the aluminum cylinder is at all defaced, this improvised mine should be destroyed in place.

#### 104. Grenade mine E-5 (Behelfsmine E-5)

a. *Description.* The improvised antipersonnel grenade mine E-5 (fig. 127) consists of a sheet-metal box and lid, about 8 inches square and 4 inches high. The box, painted a dark green drab, contains five standard French egg hand grenades. The four outer grenades are of the thin-shelled concussion type and the central grenade, which acts as a booster charge, is a thick-shelled fragmentation type. A Buck chemical fuze (par. 28) is screwed into a metal adapter in the central fuze well in the lid and the adapter is screwed into the fuze well of the fragmentation grenade.

b. *Employment.* This mine is laid along road shoulders, trails, and hedgerows as an antipersonnel mine.

c. *Functioning.* A pressure of 15 pounds on the Buck chemical fuze, or on a pressure board laid over the mine, crushes the fuze and fires the fragmentation grenade. This grenade, in turn, detonates the four concussion grenades.

d. *Installing and Arming.*

- (1) Place four concussion grenades in the corners of the box and a fragmentation grenade in the center of the box.
- (2) Place the lid on the box.
- (3) Grasping the Buck chemical fuze as near to the base as possible, screw it,

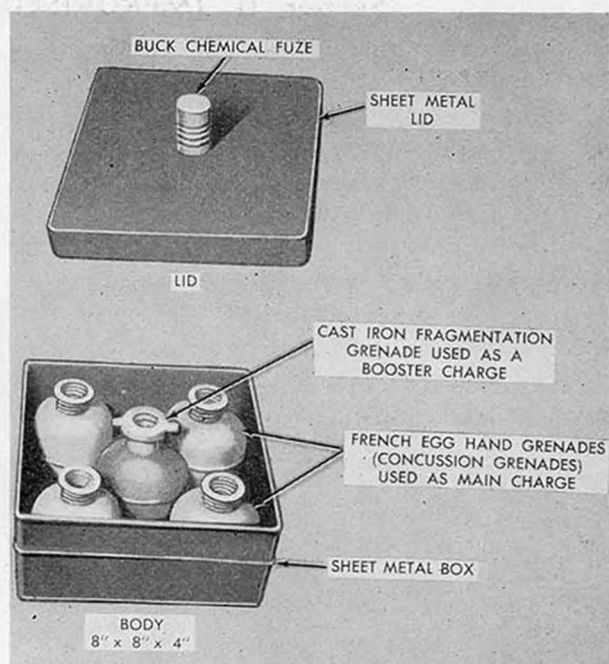


Figure 127. Improvised antipersonnel grenade mine E-5.

with the attached detonator, into the fuze well in the center of the lid.

e. *Neutralizing.* There is no safety device on this mine.

- (1) Unscrew the fuze, holding it as near the base as possible.
- (2) Remove the detonator.

*Note.* If the aluminum cylinder is at all defaced, this improvised mine should be destroyed in place.

#### 105. Tread Mine (Behelfs Brettstückmine)

a. *Description.* This improvised antipersonnel tread mine (fig. 128) consists of a standard German 1 kilogram (2.2 pound) slab charge wired on its side to a base board. This main charge is fitted with a pressure fuze 35 (par. 24) and covered with a wooden pressure board which is wired to the base board.

b. *Employment.* This mine is laid along road shoulders, trails, and hedgerows as an antipersonnel mine.

c. *Functioning.* Pressure on the pressure board actuates the fuze and detonates the main charge.



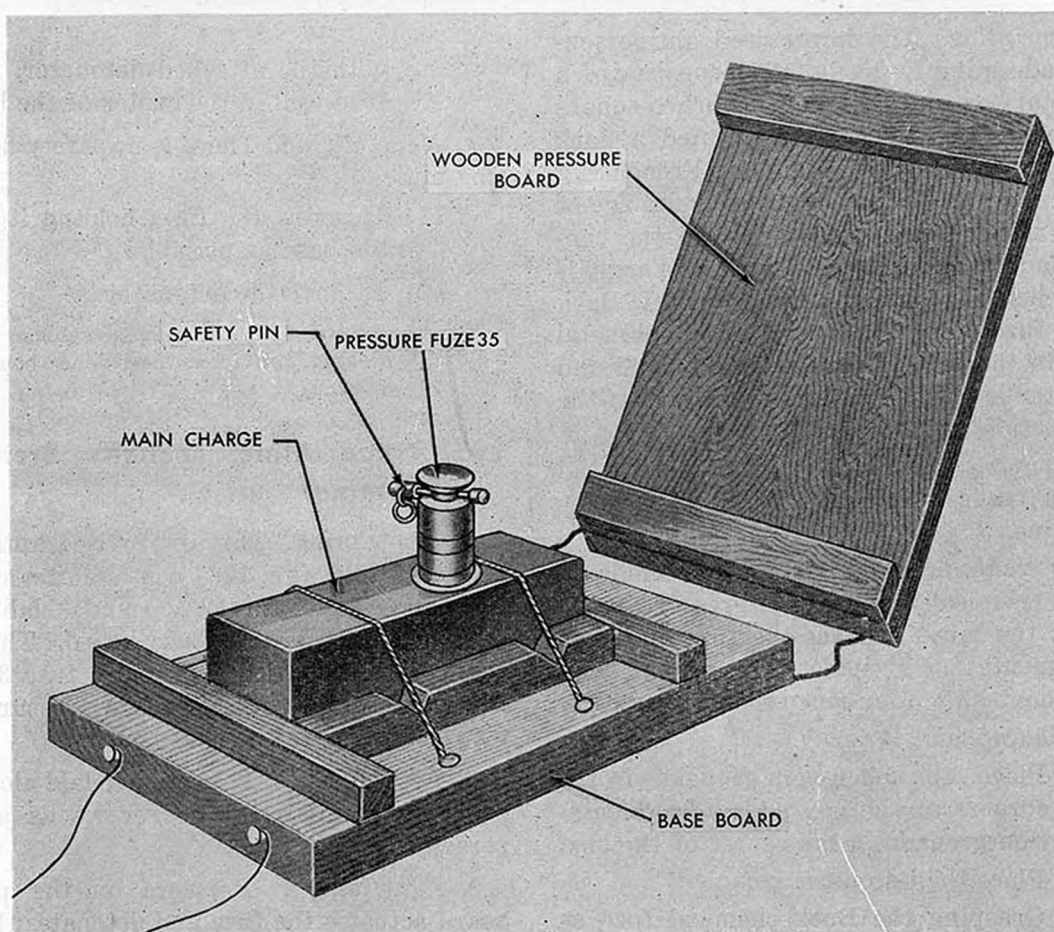
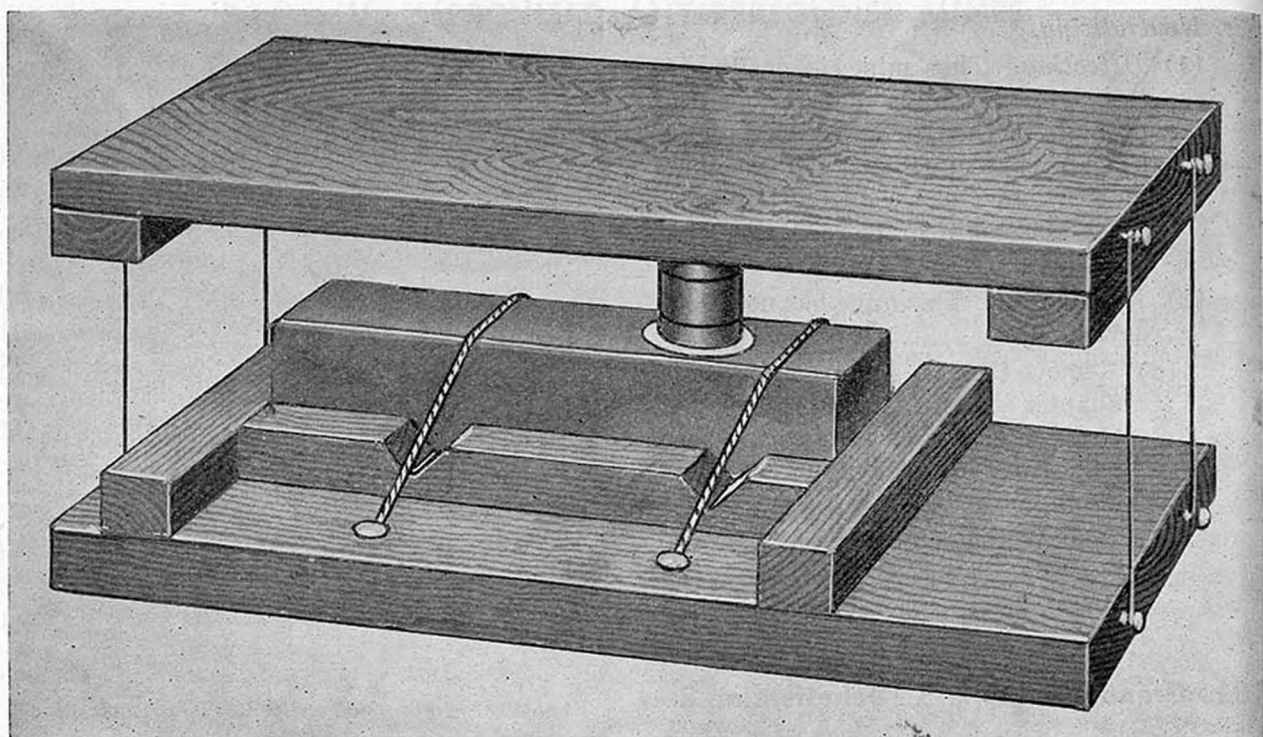


Figure 128. Improvised antipersonnel tread mine.

*d. Installing and Arming.*

- (1) Wire the main charge to a board so that the fuze well in one side of the charge faces upward.
- (2) Screw a pressure fuze 35, with detonator, into the fuze well.
- (3) Adjust the height of the pressure cap by rotating it.
- (4) Wire the pressure board, over the fuze, to the base board.
- (5) Place the mine in a hole so the pressure board will be level with the ground surface.
- (6) Remove the safety pin from the fuze.

*e. Neutralizing.*

- (1) Cut the wires holding the pressure board to the base board and lift off the pressure board.
- (2) Insert a nail or stiff wire in the safety-pin hole of the fuze.
- (3) Unscrew the fuze from the charge.
- (4) Remove the detonator.

## 106. Ration-Can Mine

*a. Description.* The improvised antipersonnel ration-can mine (fig. 129) consists of an empty ration can with a hole punched in the lid for insertion of a pull or pressure fuze. A 100-gram (0.22 pound) cylindrical demolition charge is used as the main charge. This charge is surrounded by broken glass, scrap metal, and other fragments which act as shrapnel when the mine explodes. The lid of the ration can is held in place by a wire or cord wrapped a number of times lengthwise around the can.

*b. Employment.* This mine is laid as either a pressure or trip-wire actuated antipersonnel mine or booby trap.

*c. Functioning.* Actuation of the fuze sets off the detonator, exploding the 100-gram (0.22 pound) main charge which scatters the shrapnel.

*d. Installing and Arming.*

- (1) Pierce a hole in the center of the lid of an empty ration can which still has the lid attached.
- (2) Insert a 100-gram (0.22 pound) cylindrical main charge into the can, with the fuze well up.

- (3) Fill the can with rocks, scraps of metal, or glass fragments.
- (4) Close the lid and screw a pressure or pull fuze with detonator attached into the fuze well of the main charge, through the hole in the lid of the can.
- (5) Wrap wire or cord lengthwise around the can to keep the lid in place.
- (6) Lay the mine in a hole and arm the fuze according to the procedure outlined in chapter 5.

*e. Neutralizing.*

- (1) Neutralize the fuze.
- (2) Unscrew the fuze from the main charge.
- (3) Remove the detonator.

## 107. Ski Mine (Skimine)

*a. Description.* The improvised antipersonnel ski mine (fig. 130) consists of a pointed steel tube (a section of pipe) containing a main charge of two or three 100-gram (0.22 pound) cylindrical charges. The mine is fitted with an S-mine fuze 35 (par. 25). A wooden plug fits in the top of the mine. This plug has a hole in the center through which the S-mine fuze 35 and the detonator are inserted.

*b. Employment.* This mine was designed for employment in winter warfare. It is installed in ski or sled trails and in front of unit positions.

*c. Functioning.* Pressure of 15 pounds on the pressure prongs of the S-mine fuze 35 actuates the fuze and fires the detonator and the main charge.

*d. Installing and Arming.*

- (1) Drive the pipe part of the way into the ground at an angle of 45° to 60° to the direction of expected traffic.
- (2) Place the cylindrical charges in the pipe.
- (3) Insert the wooden plug in the top of the pipe.
- (4) Insert the detonator in the base of the fuze.
- (5) Screw the fuze into the mine.
- (6) Unscrew the retaining nut from the end of the safety pin and withdraw the safety pin.

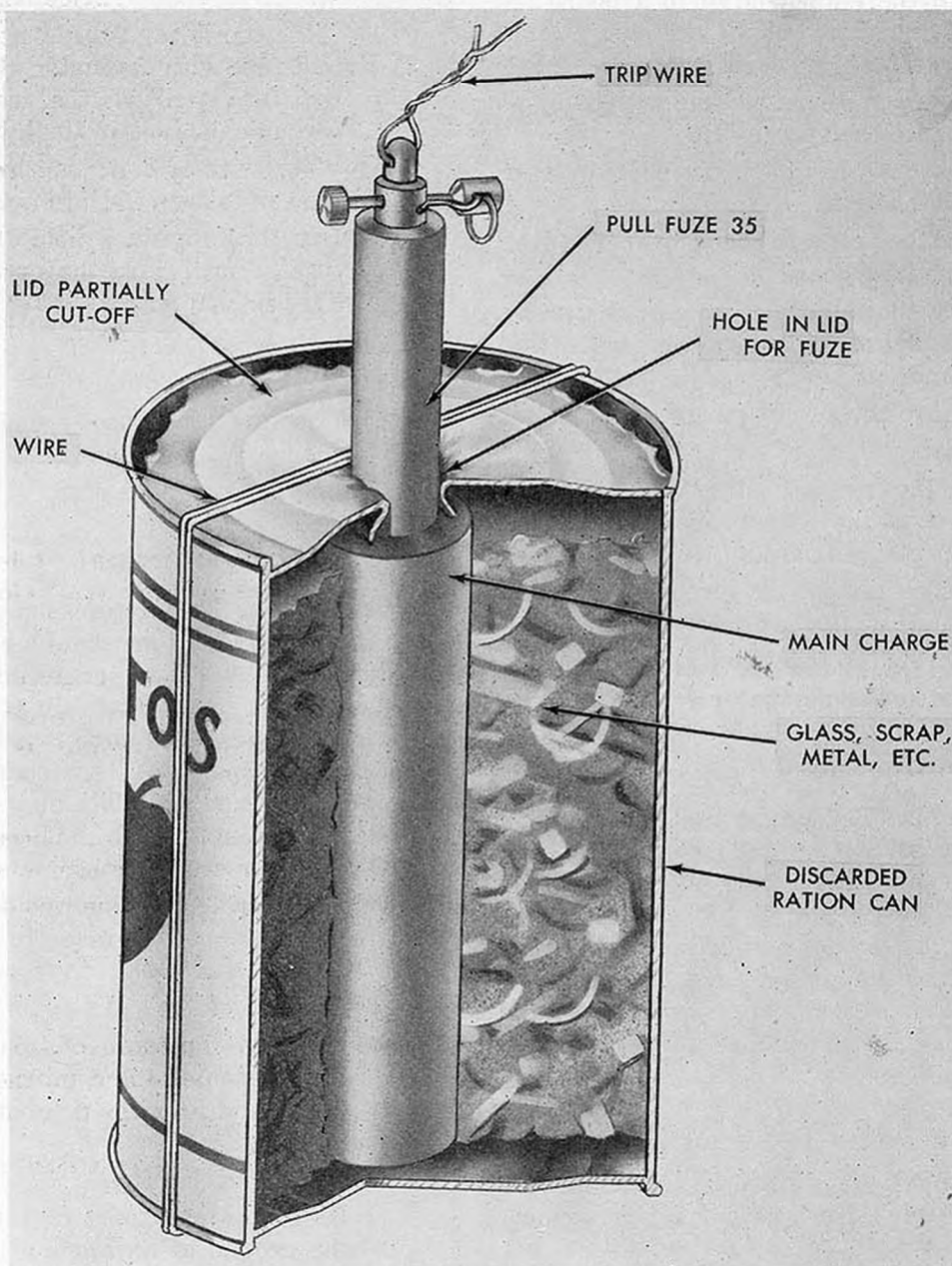


Figure 129. Improvised antipersonnel ration-can mine.

- (7) Cover the remainder of the mine with snow.

*e. Neutralizing.*

- (1) Insert a safety pin in the fuze.
- (2) Unscrew the fuze from the mine.
- (3) Remove the detonator.

## 108. Plastic-Explosive Mine

*a. Description.* This improvised antipersonnel plastic-explosive mine (fig. 131) consists of a main charge of several packages of plastic explosive tied together around a 200-gram (0.44 pound) booster charge. These mines



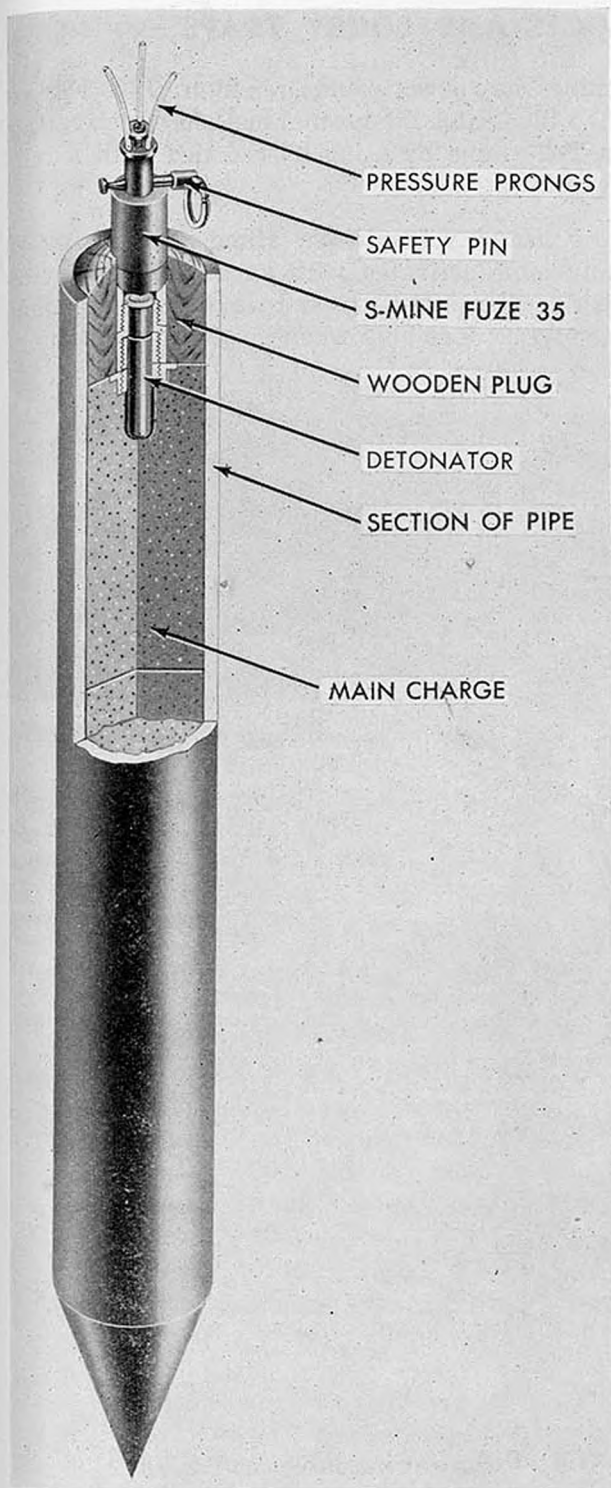


Figure 130. Improvised antipersonnel ski mine.

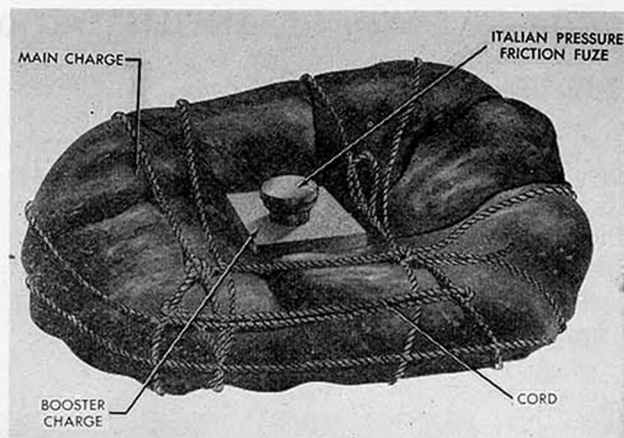


Figure 131. Improvised antipersonnel plastic-explosive mine.

usually were fuzed with an Italian pressure friction fuze, designed for the Italian four-fuze mine.

*b. Employment.* This mine is laid within positions of opposing forces after infiltration behind their lines. It usually is laid on the shoulders of roads.

*c. Functioning.* Pressure crushes the Italian pressure friction fuze, actuating it and firing the detonator, the booster charge, and the main charge.

*d. Installing and Arming.*

- (1) Mold the plastic explosive around the booster charge and tie the plastic explosive in place with a cord.
- (2) Insert the fuze, with detonator, in the booster charge.

*e. Neutralizing.*

- (1) Examine the mine for trip wires attached to the binding cord.
- (2) Lift the fuze from the booster charge.
- (3) Remove the detonator.

### Section III. ANTILIFTING DEVICES AND BOOBY TRAPS

#### 109. General

*a. Employment.* The German Army developed antilifting devices (pars. 110 through 114) to activate mines and thus prevent, or impede, their removal (pars. 3 and 5). These antilifting devices operate either by pressure release, pull, or a combination of both of these methods. They may also be used as booby traps. Teller-

mines may be activated as in figure 132. Figure 133 illustrates the normal method of activating a Tellermine by using a fuze tied with a trip wire.

*b. Hand Neutralizing.* Hand neutralizing of any mine activated with an antilifting device is dangerous, tedious, and time consuming and should be done only when absolutely necessary.

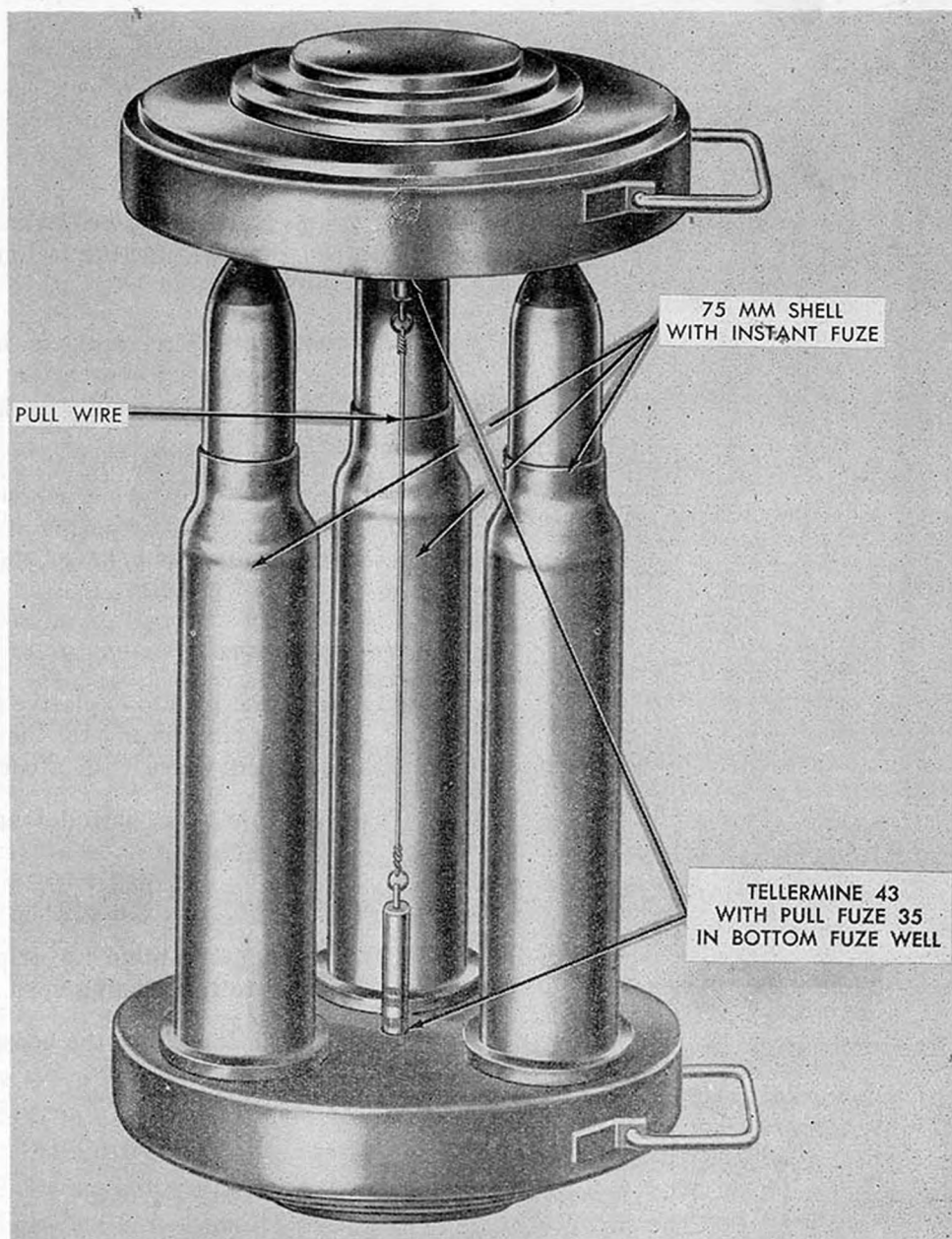


Figure 132. Two Tellermines installed with three 75-mm shells.

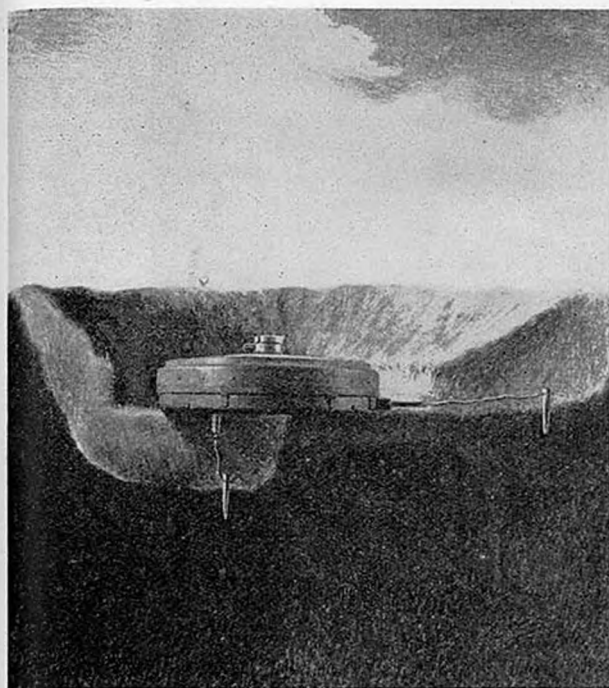


Figure 133. Teller mine with normal activating fuzes.

Removal as prescribed in paragraph 10b is recommended, but if hand neutralization is necessary, proceed as follows:

- (1) Very carefully remove the dirt from the top and sides of the mine, avoid any trip wires that may be present.
- (2) Cut all slack trip wires.
- (3) Identify and neutralize any activating fuzes that may be found.
- (4) From a distance of approximately 6 inches from the side of the mine, and at a level just slightly below the bottom of the mine start digging toward the mine.
- (5) If contact is made with an object under the mine, carefully clear away sufficient dirt to identify the object. Do not remove any dirt from underneath the object; if it is an antilifting device it will not function as long as the mine is exerting pressure on the top of the device.
- (6) If the object is identified as an antilifting device, neutralize it according to the specific neutralization procedure for the device.
- (7) If unknown or nonstandard fuzes are encountered, stop the hand removal.

Pull the mine from the hole with a 50-yard length of rope.

- (8) After all of the fuzes and/or antilifting devices have been located and neutralized, remove the mine from the ground.

#### 110. Metal Pressure-Release Antilifting Device SM 2 (Entlastungszünder Sofortzünder aus Metall; E.Z.SM 2)

*a. Description.* The metal pressure-release antilifting device SM 2 (fig. 134) was formerly designated the E.Z. 44 and consists of a circular, flat, sheet-metal case 5 inches in diameter and 1 5/8 inches in height. The case houses a main charge of two semicircular 0.25-pound blocks of explosive, a clockwork mechanism with a spring-loaded striker, and a detonator assembly (Zündersprengkapsel 43). The total weight of this device is 1.2 pounds. The device consists of three parts—

- (1) The pressure-release assembly includes a striker-release plunger that protrudes through the top of the case, a plunger spring, and a striker-retaining arm.
- (2) The clockwork mechanism consists of a winding post which protrudes through the top of the case, a special winding key, a rubber washer, a clockwork spring, a rotor wheel, and a governor.
- (3) The fuze assembly is composed of a striker, a striker shaft shoulder, a striker spring, a percussion cap, and detonator assembly. An externally located safety bar passes through the striker-release plunger and engages the rotor wheel. An internally located safety pin engages the striker shaft. A rubber waterproofing cap fits over the striker-release plunger.

*b. Employment.* This pressure-release antilifting device is employed to activate antitank mines (fig. 135) and may also be used as a booby trap.

*c. Functioning.* As the weight is lifted from the pressure-release assembly the striker-release plunger and the striker-retaining arm



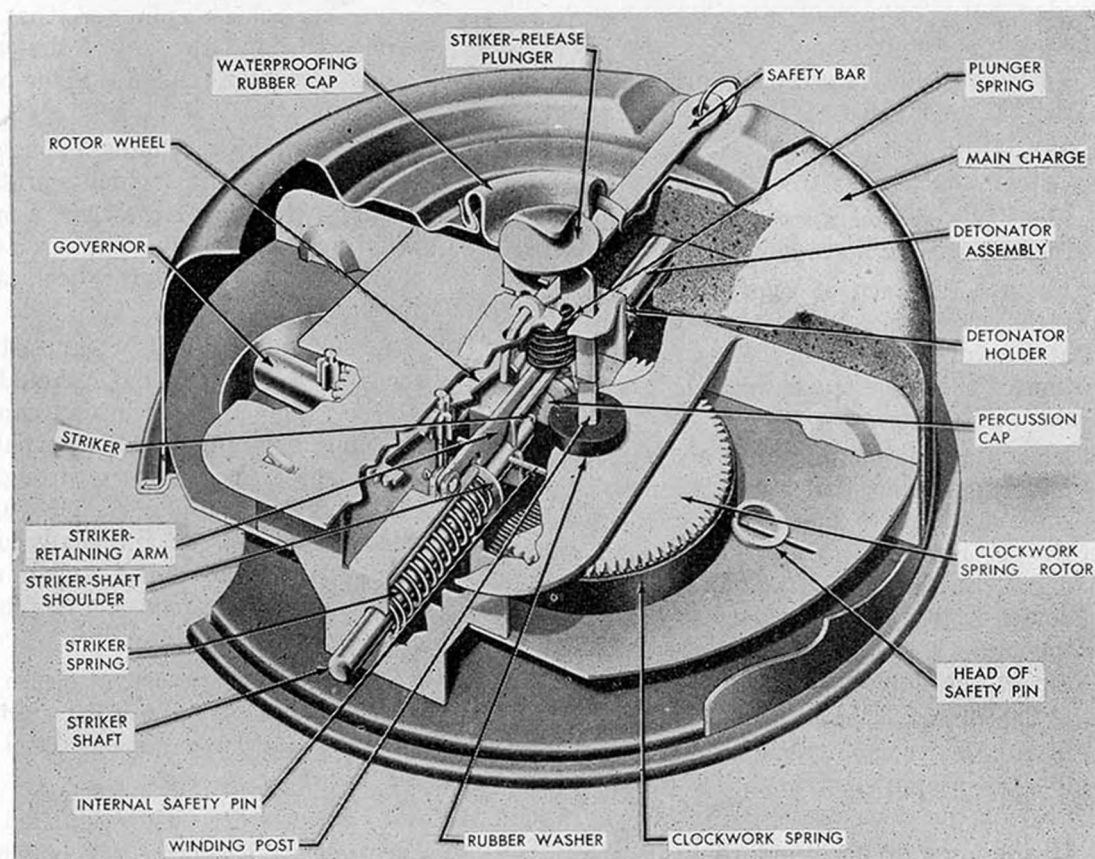
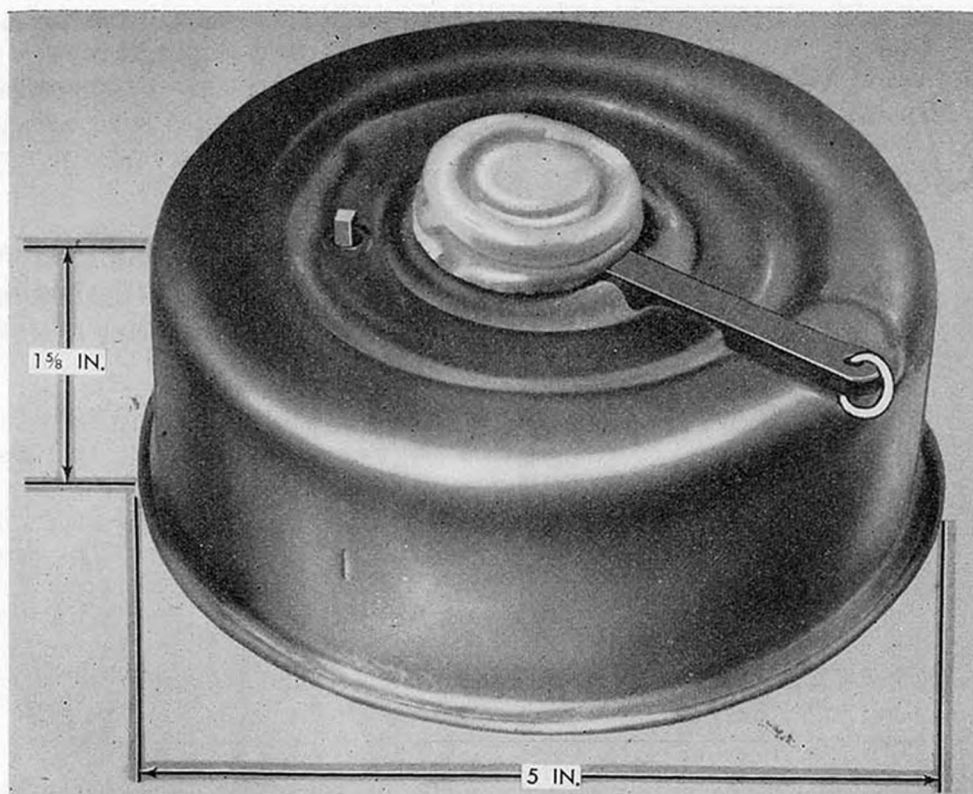


Figure 134. Metal pressure-release antilifting device SM 2.

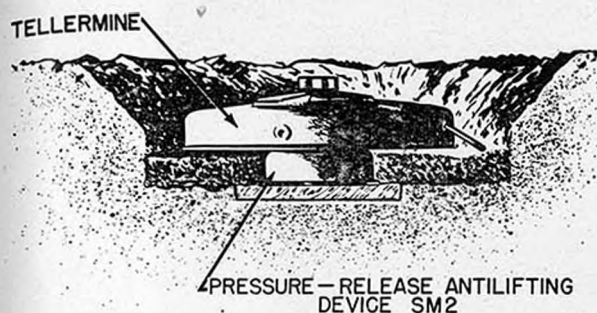


Figure 135. Pressure-release antilifting device placed under a mine.

move upward, releasing the spring-loaded striker against the percussion cap and firing the antilifting device.

*d. Installing and Arming.*

- (1) Wind the clockwork mechanism fully with the special winding key.
- (2) Place the mine to be activated on the striker-release plunger. The weight of the mine moves the striker-release plunger downward and allows the safety bar to ride free of the plunger slot.
- (3) Withdraw the safety bar with the 58-inch arming cord, freeing the rotor wheel and permitting the clockwork mechanism to function. The coils of the clockwork spring expand and push against the head of the safety pin, disengaging it from the striker. The clockwork spring runs from 1 to 11½ minutes with a loud buzzing sound until it withdraws the safety pin. When the buzzing stops, the antilifting device is armed.

*e. Neutralizing.* Once armed, this antilifting device cannot be neutralized. Destroy it in place. See also paragraph 109b.

*f. Packing.* Five of these pressure-release antilifting devices are packed in a rectangular, wooden box together with two special winding keys and five 58-inch arming cords (fig. 136). A descriptive label is pasted on the lid of the box.

# **111. Pressure-Release Antilifting Device SF 3 (Entlastungszünder Sofort- zünder Metallfrei; E.Z. SF 3)**

*a. Description.* The pressure-release antilifting device SF 3 (fig. 137) consists of cylindrical,

bakelite case, about 3 inches high and 3¼ inches in diameter and contains very little metal. The case has a screw-on, disk-shaped bakelite lid containing a built-in fuze case. A flat, metal combination safety-and-arming bar, to which an arming cord is attached, holds down the moveable, spring-loaded, striker-release disk. The fuze case contains a spring-loaded striker, a striker-retaining arm, a glass vial of chemical, a soluble pellet, and an arming spindle which is turned by the safety-and-arming bar to crush the vial of chemical when the antilifting device is to be armed. A rubber waterproofing cap covers the fuze mechanism. The 7-ounce main charge is cylindrical and hollow, like a section of a pipe.

*b. Employment.* This pressure-release antilifting device is employed to activate mines and may also be used as a booby trap.

*c. Functioning.* In the unarmed position the flat side of the arming spindle is against the glass vial of chemical. When the arming spindle is rotated 90° by the safety-and-arming bar it crushes the glass vial of chemical. The chemical then dissolves the safety pellet, which, with the projection on the under side of the striker-release disk, holds the striker-retaining arm in place. This takes from about 2 minutes (at 95° F.) to 40 minutes (at 31° F.). The antilifting device is now armed. The striker-retaining arm is now held in position only by the projection on the under side of the striker-release disk. When the weight is lifted from this antilifting device (fig. 138), the striker-release disk rides upward under the force of the compressed release spring until the top of the striker-retaining arm is no longer held in place by the projection on the under side of the striker-release disk. The spring-loaded striker then forces the bottom of the striker-retaining arm to tilt outward and is released against the percussion cap, firing the antilifting device.

*d. Installing and Arming.*

- (1) Before laying the antilifting device, loosen the arming cord from the lid to which it is fastened.
- (2) Then lay the antilifting device on a firm base in a deepened mine hole with the safety-and-arming bar pointing to the right, when facing the opposing

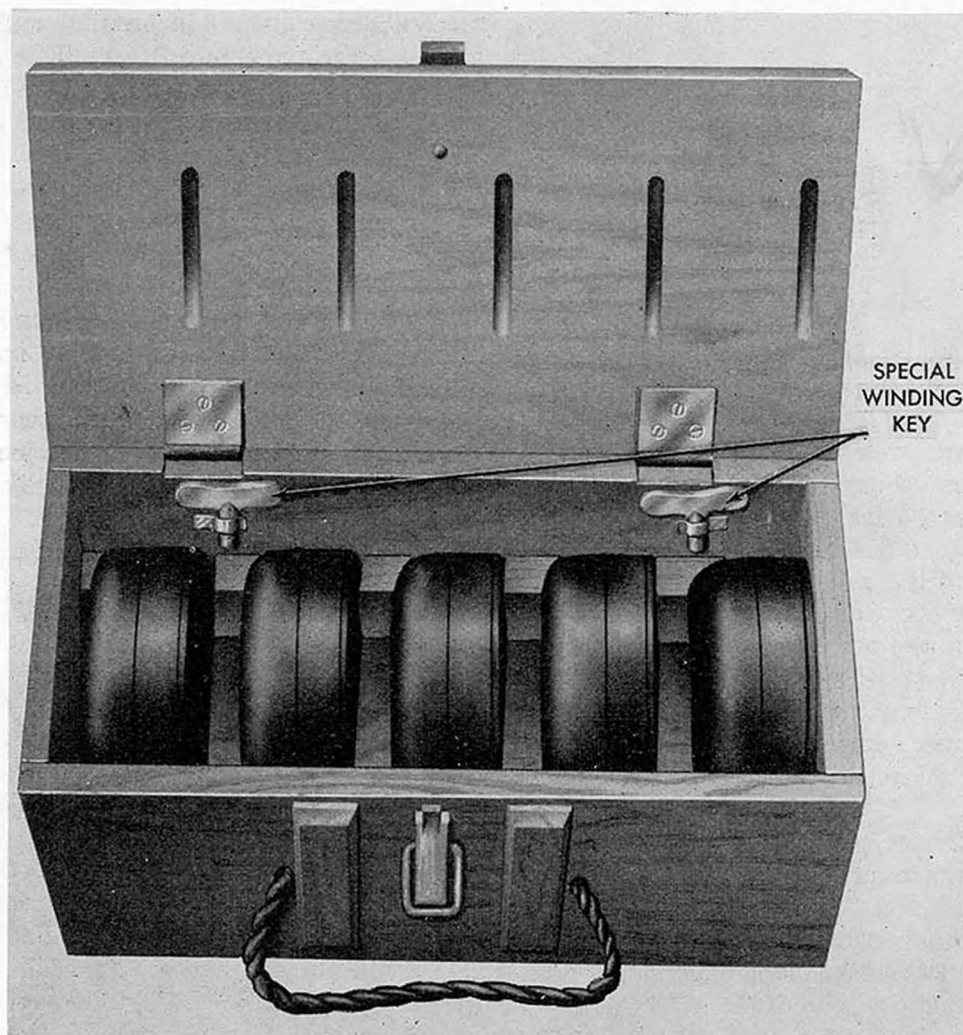


Figure 136. Packing of the pressure-release antilifting device SM 2.

force, and with the arming cord lying out to the rear.

- (3) Carefully press earth around the antilifting device, by hand, keeping the top of the antilifting device clear and the safety-and-arming bar free to move.
- (4) Place the mine to be activated centrally on the top of the antilifting device.
- (5) Fill in the hole.
- (6) Pull lightly on the arming cord, rotating the safety-and-arming bar 90°. This causes the arming spindle to crush the glass vial of chemical, which arms the antilifting device by dissolving the safety pellet.

*e. Neutralizing.* Once armed, this antilifting device cannot be neutralized. Destroy it and

the activated mine in place. See also paragraph 109b.

*f. Packing.* Five of these pressure-release antilifting devices are packed in a rectangular wooden box.

## 112. Nipolite Pressure-Release Antilifting Device

*a. Description.* The Nipolite pressure-release antilifting device (fig. 139) consists of a main charge of two rectangular blocks of molded Nipolite explosive, held together by two brass bolts. This antilifting device is  $3\frac{7}{8}$  inches long, 2 inches wide, and  $1\frac{1}{8}$  inches high. Recesses in the inner surfaces of the blocks contain a spring-loaded striker, a striker-release lever, a percussion-cap-and-detonator assembly, and two



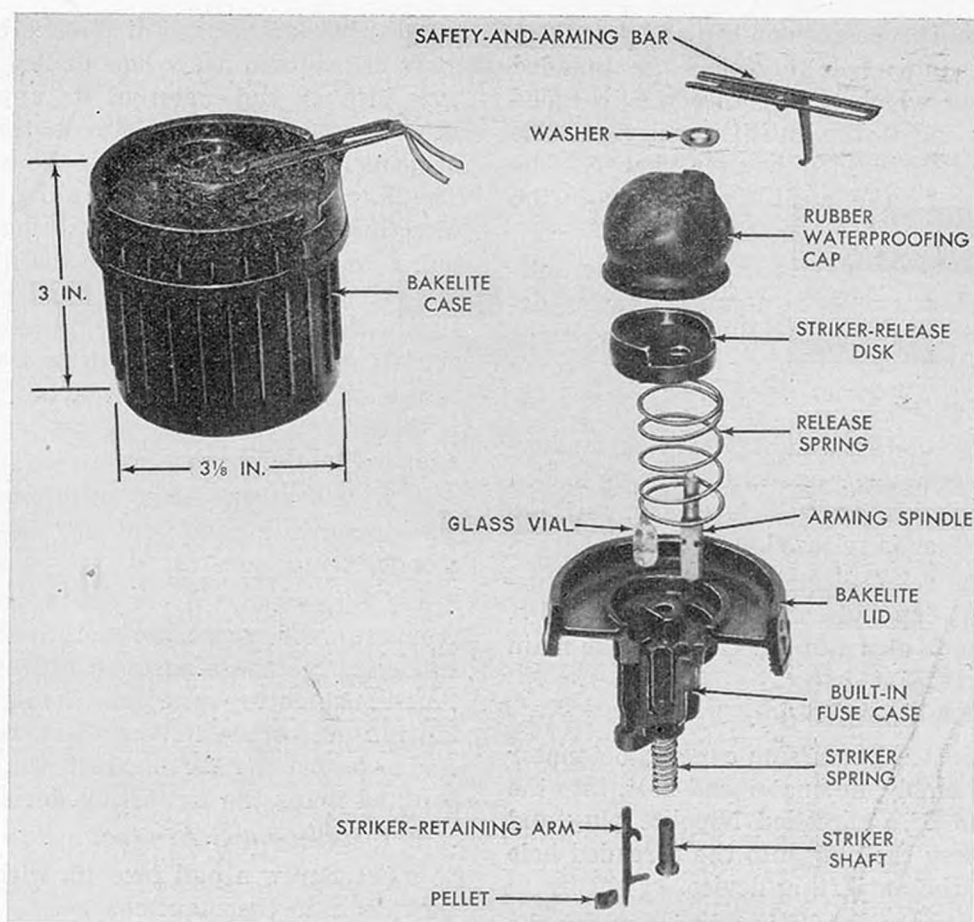


Figure 137. Pressure-release antilifting device SF 3.

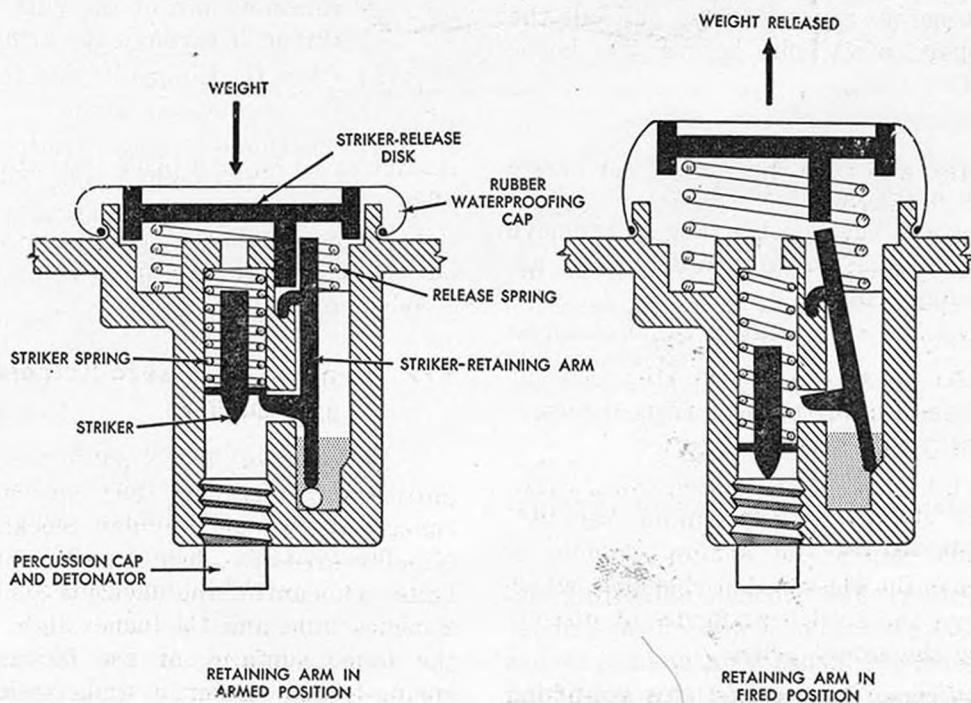


Figure 138. Action of the pressure-release antilifting device SF 3 when weight is lifted.

safety pins. The percussion-cap-and-detonator assembly fits into a hole at one end of a threaded Nipolite plug which screws into the threaded hole at one end of the antilifting device. The Nipolite plug acts as a booster charge. The total weight of the antilifting device is 9.5 ounces.

*b. Employment.* This pressure-release antilifting device is employed as an activating device for antitank mines as well as a main charge for booby traps.

*c. Functioning.*

- (1) Lifting the weight from the striker-release lever allows the spring-loaded striker to pivot the lever arm until the striker is released.
- (2) The released striker fires the percussion-cap-and-detonator assembly, which explodes the plug and the main charge.

*d. Installing and Arming.*

- (1) Insert a percussion-cap-and-detonator assembly, detonator end first, into the end of a threaded Nipolite plug and screw the plug into the threaded hole in the antilifting device.
- (2) Place the antilifting device under the object to be booby trapped and pull out the safety pins. *Always* pull out the upper safety pin before the lower safety pin.

*e. Neutralizing.*

- (1) Insert a strong wire or nail through the lower safety-pin hole.
- (2) Unscrew the Nipolite plug and remove the percussion-cap-and-detonator assembly from it.

*Note.* If the antilifting device cannot be neutralized without disturbing its position, or if the lower safety-pin hole is not accessible, it should be destroyed in place. See also paragraph 109b.

### 113. Wooden Antilifting Device (Entlastungsmine)

*a. Description.* The wooden antilifting device (fig. 140) consists of a wooden case, about 6 $\frac{1}{4}$  inches long, 4 $\frac{3}{4}$  inches wide, and 2 $\frac{1}{4}$  inches high. The wooden case contains a 0.5-pound main charge and a pull fuze 42 (par. 42). A

wooden block is located at the end opposite the main charge and has a hole drilled part of the way through the center of its upper side. A strong actuating spring fits in this hole and projects above the top edge of the wooden case. The hinged lid has a small arming hole located directly above the striker-retaining pin of the pull fuze 42, and a spring recess directly over the actuating spring. The hinged lid is held shut with an improvised latch, compressing the actuating spring. An actuating wire attached to the striker-retaining pin of the pull fuze 42 is threaded through the arming hole in the lid and tied to a nail lying across the arming hole.

*b. Employment.* This antilifting device is used to activate mines and may also be used as a booby trap.

*c. Functioning.* When the weight is lifted from the wooden case, the compressed actuating spring forces the hinged lid up. At the same time the actuating wire pulls the striker-retaining pin out of the striker shaft, releasing the spring-loaded striker against the percussion cap and firing the antilifting device.

*d. Installing and Arming.*

- (1) Screw a pull fuze 42, with detonator, into the main charge.
- (2) Tie an actuating wire to the striker-retaining pin of the pull fuze 42 and thread it through the arming hole.
- (3) Close the hinged lid and fasten it with the improvised latch.
- (4) Tie the actuating wire to a nail lying across the arming hole. Be careful not to pull on the actuating wire so as to pull out the striker-retaining pin.
- (5) Place the antilifting device in a hole and place a mine or charge on top of it.

**Caution:** Be certain the mine or charge is heavy enough to hold the hinged lid down against the force of the compressed actuating spring.

- (6) Carefully disengage the improvised latch on the hinged lid.

*e. Neutralizing.* See also paragraph 109b.

- (1) Secure the hinged lid tightly with the improvised latch.
- (2) From a distance of 50 yards, pull the mine from the hole with a rope or wire.

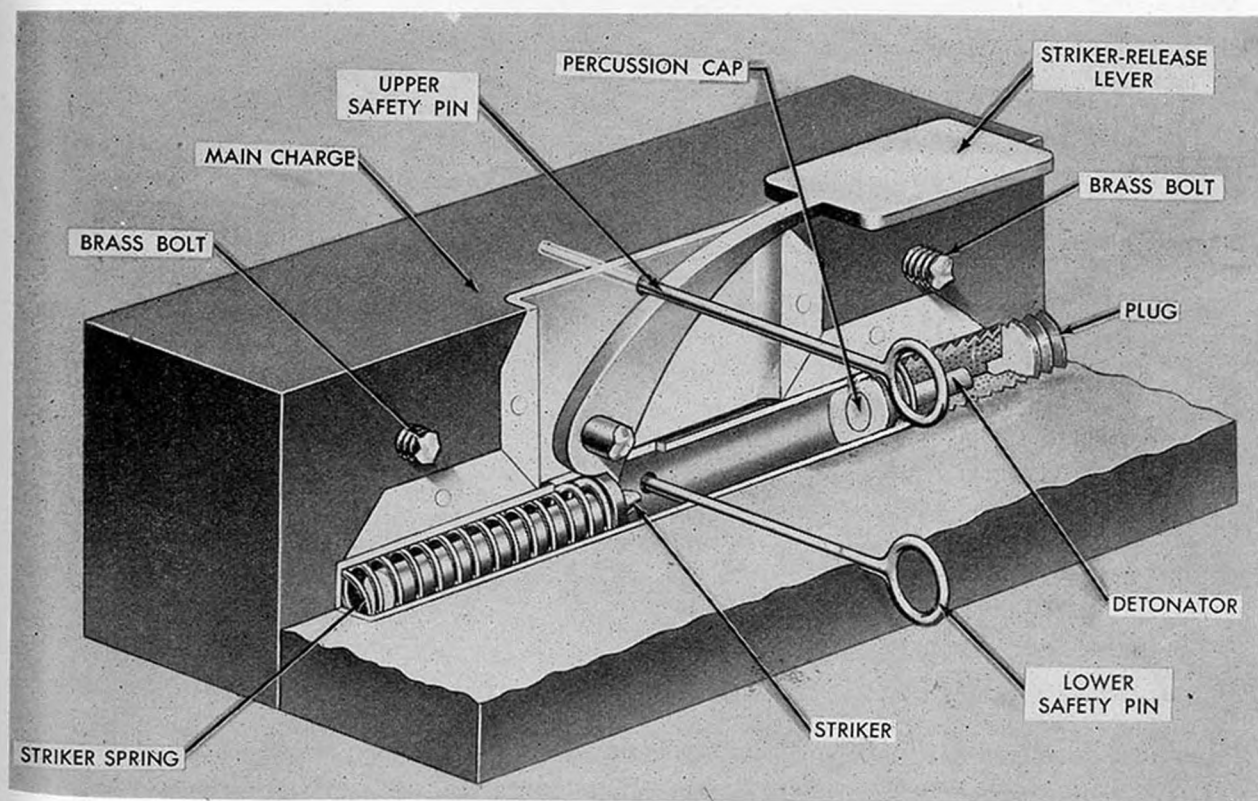
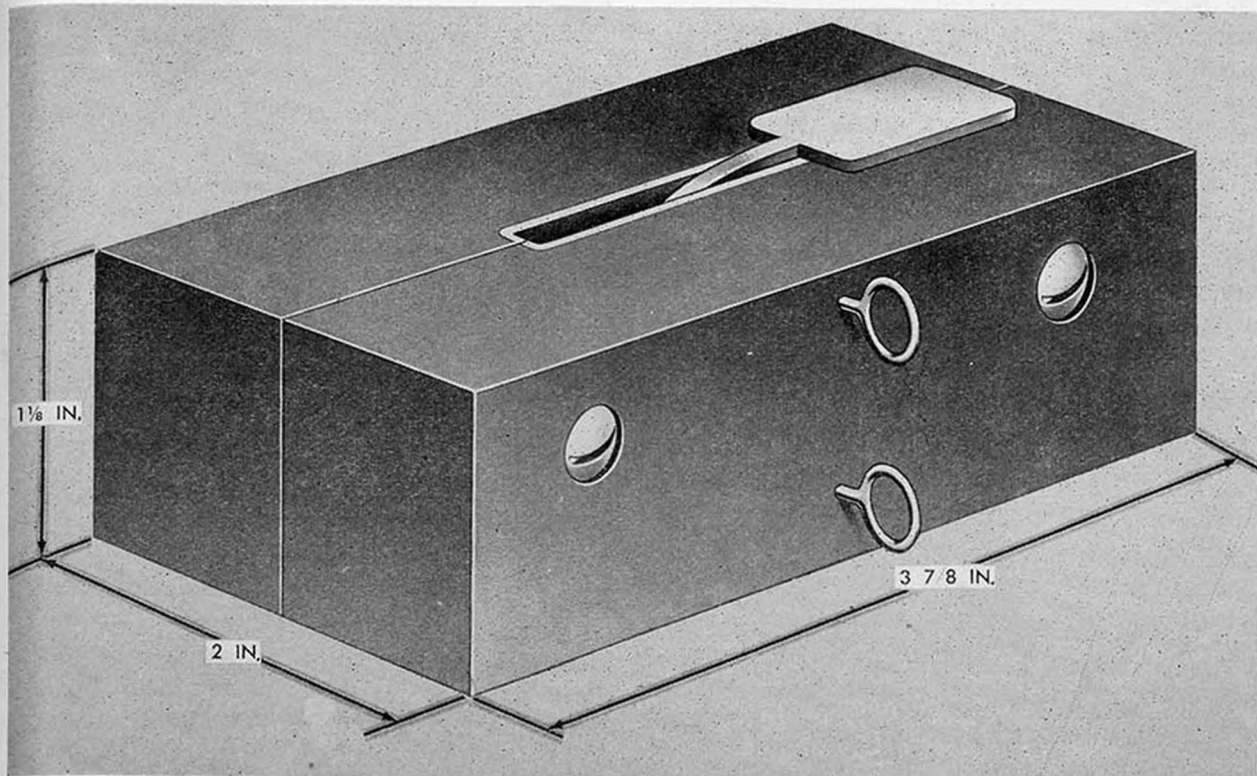


Figure 139. Nipolite pressure-release antilifting device.



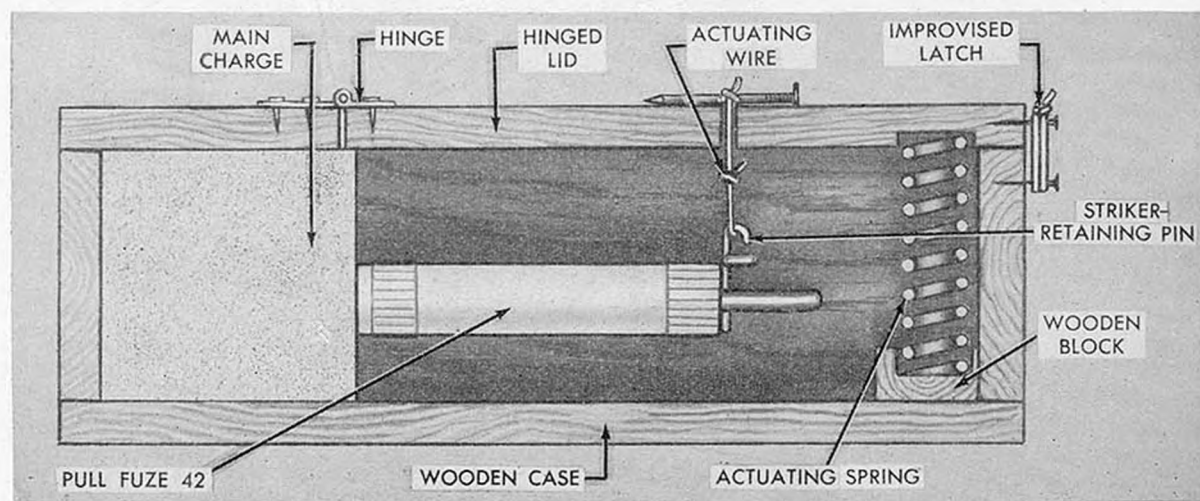
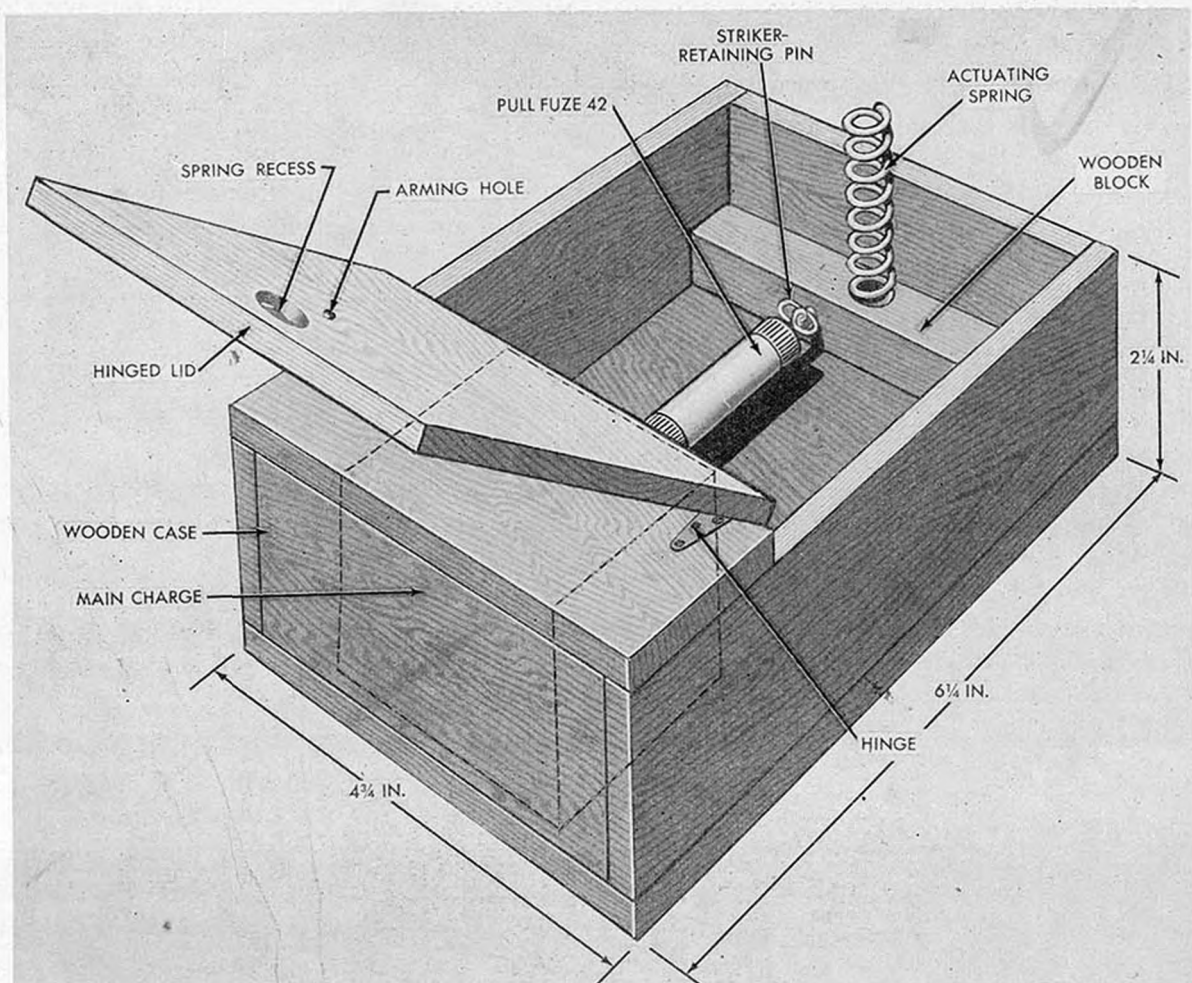


Figure 140. Wooden antilifting device.

- (3) Cut or untie the actuating wire attached to the striker-retaining pin of the pull fuze 42.
- (4) Carefully raise the hinged lid.
- (5) Unscrew the fuze and remove the detonator from it.

#### 114. Improved Antilifting Device for Antitank Mines

*a. Description.* This improvised antilifting device for antitank mines (fig. 141) consists of a wooden frame containing a pull fuze 42 (par. 42) inserted in a 0.5-pound main charge. A mine, with a small lug welded to its pressure plate, is lashed to the wooden frame. One end of the activating wire is attached to the welded lug, and the other end to the striker-retaining pin of the pull fuze 42.

*b. Employment.* The improvised antilifting device is used to activate antitank mines.

*c. Functioning.* When the mine is lifted, the activating wire pulls the striker-retaining pin from the pull fuze 42, releasing the spring-loaded striker against the percussion cap and firing the main charge and the mine.

##### *d. Installing and Arming.*

- (1) Place the antilifting device and the mine in a hole and cut the wire lashings.
- (2) Cover the mechanism with dirt, leaving most of the mine exposed.

##### *e. Neutralizing.* See also paragraph 109b.

- (1) Cut the activating wire between the mine and the pull fuze 42.
- (2) Check the device for the presence of any other trip wires and cut any slack wires that are found.
- (3) Remove the mine.
- (4) Remove the pull fuze 42 from the main charge of the activating device.

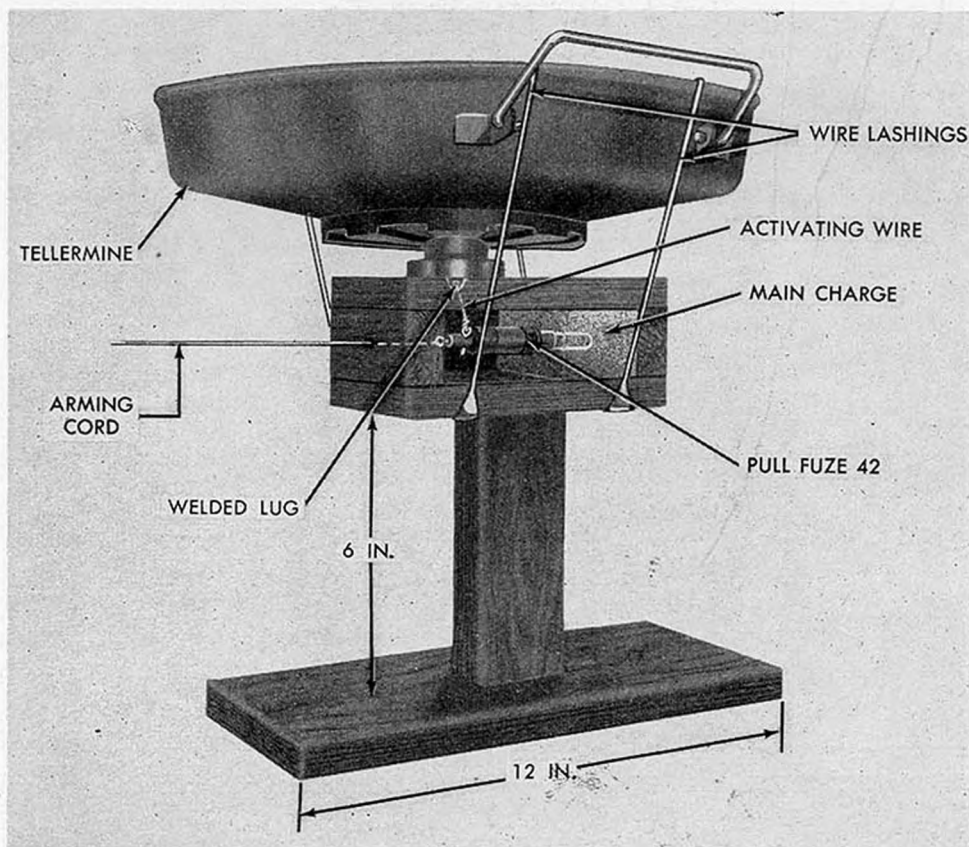


Figure 141. Improved antilifting device for antitank mines.

## 115. Common Booby Traps

The Germans used many ingenious devices as booby traps. Canteens, whistles, and candy bars are among the more commonly booby trapped devices.

*a. Canteen Booby Trap.* The canteen booby trap (fig. 142) consists of a standard German or United States canteen, containing a charge of explosive. A pull fuze is connected to the cap of the canteen by a wire. The bottom of the canteen is partly cut away to place the charge and the fuze and is then taped or puttied in place. At little water is poured into the top of the canteen to make it seem to be full of water, and the canteen is placed in its canvas case. This booby trap has an effective casualty radius of 3 to 4 yards.

*b. Whistle Booby Trap.* The whistle booby trap (fig. 143) consists of a whistle containing a charge coated with a compound which is easily ignited by heat from friction. The ball in the whistle is coated with a rough material. Blowing the whistle vibrates the ball, and the friction between the ball and the compound ignites the compound firing the charge.

*c. Candy-Bar Booby Trap.* The candy-bar booby trap (fig. 144) consists of an imitation candy bar coated with chocolate. When a piece is broken from either end of the bar, pull is exerted on a thin canvas strip connected to a fuze. After a delay of 7 seconds, the charge explodes.

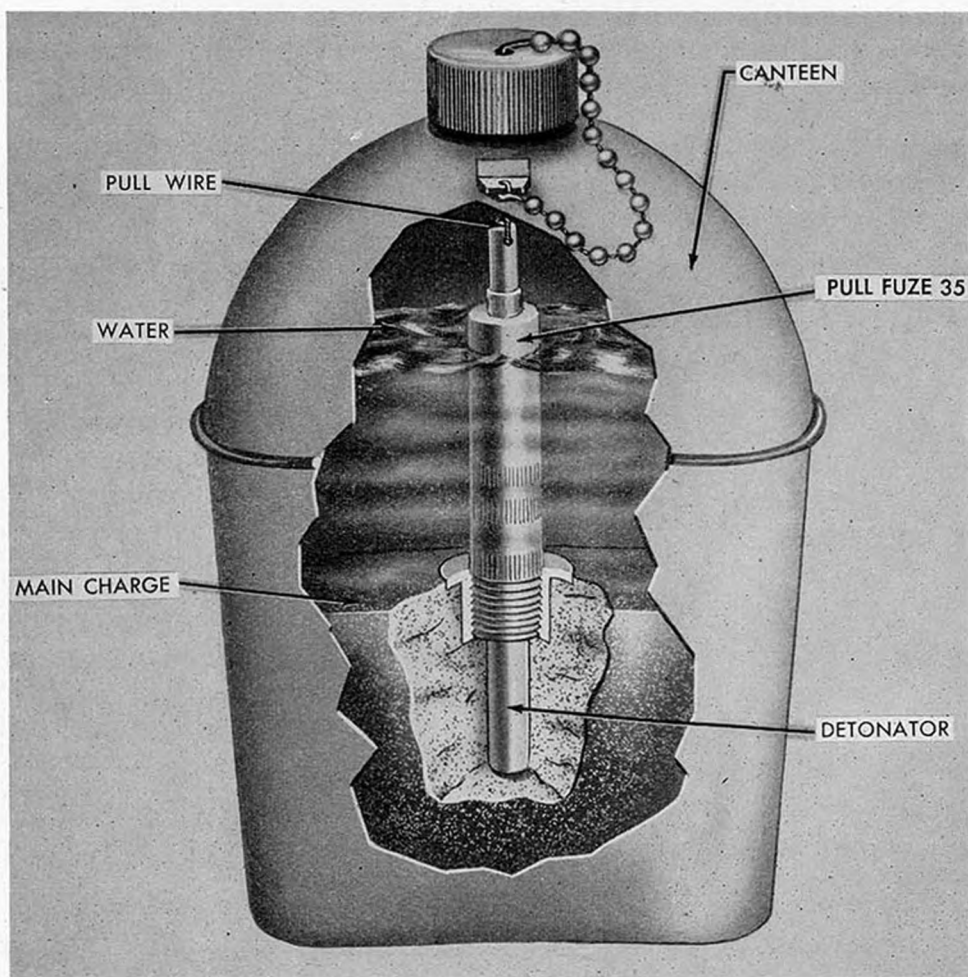


Figure 142. Canteen booby trap.



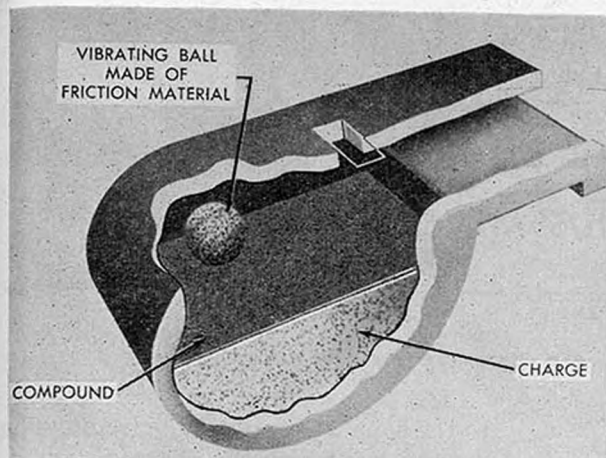


Figure 143. Whistle booby trap.

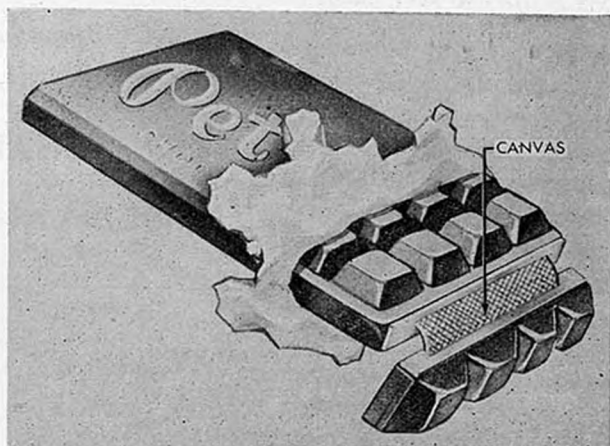


Figure 144. Candy-bar booby trap.

## CHAPTER 8

### MISCELLANEOUS MINES

#### Section I. RAILWAY MINES AND DRIFTING CONTACT MINES

##### 116. Electric Railway Mine

###### a. Description.

- (1) *Mine.* The electric railway mine (fig. 145) consists of a wooden case, 9 inches square and  $4\frac{1}{4}$  inches high, containing a main charge of explosive. The lid is secured with screws. A rubber ring is fastened to the fuze well in the lid. The brass pressure cap of an electric railway mine fuze (fig. 146) protrudes through the rubber ring and an antilifting plunger protrudes about 1 inch above the brass pressure cap. An access hole at one corner of the lid receives the electric detonator, which is connected

to the separate antilifting circuit. The energy for firing the electric detonators is supplied by a  $4\frac{1}{2}$ -volt battery which is housed in a small wooden box inside the mine. The clockwork delay mechanism, with the main detonator, is inserted through an access hole in the side of the wooden case. This access hole is covered by an interior wooden sliding plate. A fuze well is located in another side of the wooden case and other fuze wells may be present in the bottom of the case. Two small holes for testing the circuit of the mine, after it has been laid, are located in one side of the wooden case.

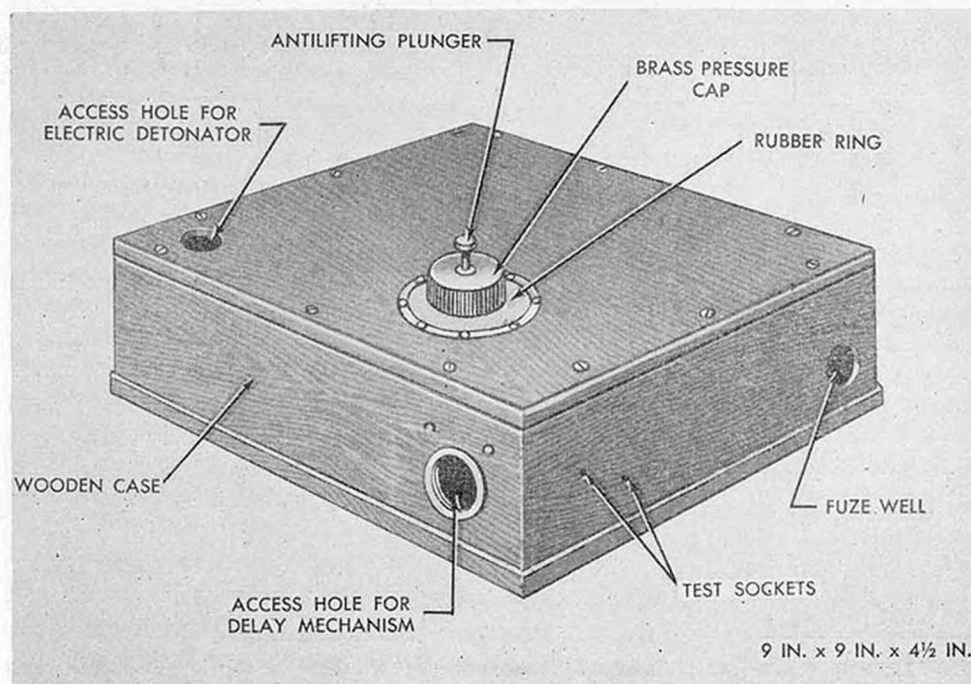


Figure 145. Electric railway mine.

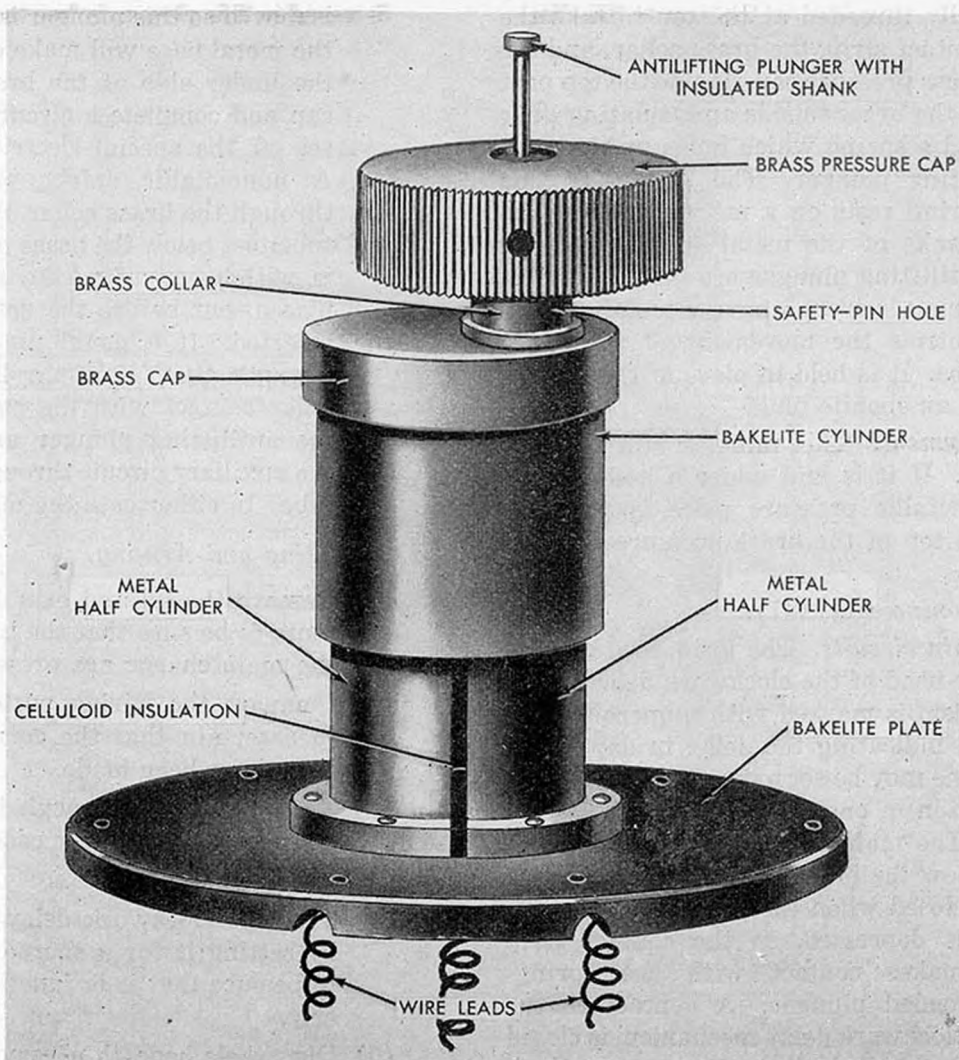


Figure 146. Electric railway mine fuze.

(2) *Fuze.* When laid, the brass pressure cap of the electric railway mine fuze (figs. 146 and 147) bears on the under side of a railroad tie and the antilifting plunger in the depressed position. The fuze case rests on a bakelite plate, which is fastened by screws to the top of the battery box. This fuze case consists of two metal half-cylinders separated by celluloid insulation. One of these metal half-cylinders is wired to one terminal of the battery by way of the main detonator and the clockwork delay mechanism, while the other metal half-cylinder is wired to the other terminal of the battery. These wired connections are made through

two of the screws that fasten the fuze case to the bakelite plate. The two metal half-cylinders are covered by a bakelite cylinder with a brass cap. As shown in figure 147, the metal half-cylinder wired to the main detonator and the clockwork delay mechanism houses, and is in electrical contact with, a spring-loaded plunger. The other metal half-cylinder houses a brass tube which is in direct electrical contact with it. Fixed on the brass tube is a square-section brass rod which projects into a vertical slot in the bottom part of the metal half-cylinder and prevents rotation of the brass tube. The brass tube is exter-



*e. Neutralizing.*

- (1) Search for and neutralize any fuzes in the sides of the mine.
- (2) Expose the mine without moving it. Remove the special electric detonator, prying it out of its recess with a screw driver if necessary.
- (3) Slide out the cover plate covering the clockwork delay mechanism. Withdraw the clockwork delay mechanism and main detonator together. To do this the wires should be cut one at a time.

**Caution:** Do not move the mine until the detonators have been withdrawn; do not insert a metallic pin in the safety-pin hole; do not allow the antilifting plunger to rise while the detonators are still in the mine; do not exert pressure on the brass pressure cap.

## 117. Spherical Drifting Mine 41 (Kugel-treibmine 41; K.Tr.Mi.41)

*a. Description.* The spherical drifting mine 41 (fig. 148) is an oval spheroid consisting of steel halves joined together by a horizontal weld and a strip on the inside of the body. A steel collar, which acts as a stand, is tack-welded onto the bottom of the mine. The collar has four horizontal slots in the top so water can pass freely around the mine, thus preventing an air-lock when the mine is placed in water. A 5-foot, telescopic contact rod with antennae at the top is mounted in a central tube. Surrounding the telescopic contact rod is a wooden stabilizing float which fits into a recess on the top of the mine in the unarmed position. Internally, the mine consists of a buoyancy chamber, a main charge cavity, and four buoyancy-adjustment compartments closed by aluminum plugs. The buoyancy-adjustment compartments contain steel pellets used to adjust the depth at which the mine is to float. An ignition tube, containing a clockwork delay mechanism, detonator, booster charge, and battery, is connected by insulated wire leads to the central contact rod tube, at the brass contact ring. The main charge cavity contains a main charge of 25.5 pounds of explosive. The total weight of the mine is 76 pounds. The horizontal diameter of

the mine is 1 foot 3 inches and it has a height of 1 foot 5 inches. When the mine is armed, the height from the bottom of the mine to the top of the telescopic contact rod is 6 feet 7½ inches.

*b. Employment.* This mine is designed to damage pontons, ponton-bridge superstructure, bridge piers, and low-level bridges. It is launched upstream of the objective and allowed to drift until fired by contact with the objective. It may also be used as an antitank mine.

*c. Functioning.*

- (1) When the mine is floated, water dissolves the soluble plug at the base of the telescopic contact-rod case, freeing the telescopic contact rod, which is spring-loaded.
- (2) As the mine sinks below the surface of the water, the wooden stabilizing float, attached to the telescopic contact-rod case, causes the telescopic contact rod to extend to its full 5-foot length. The wooden stabilizing float also keeps the mine upright.
- (3) When an object deflects it, the telescopic contact rod touches the brass contact ring and completes the firing circuit, detonating the mine.

*Note.* A small clockwork delay mechanism in the fuze case can be regulated so the mine will detonate after any set time up to 6 days, even if the rod is not deflected. If the rod is deflected before the set time, the clockwork delay mechanism will be short-circuited, and the mine will fire.

*d. Installing and Arming.* Place the mine in the water and remove the safety pin. When the soluble plug dissolves, the mine arms itself as described in *c*(2) above.

*e. Neutralizing.* There is no way to neutralize this mine. It is best to explode it either by small arms fire or by a rocket launcher directed at the antennae. Another method is to stretch a rope or wire across the stream downstream from the mine so that the mine will drift into it. If a bridge or other vital installation is threatened by a mine which is lodged against it but still afloat, a line may be attached to one of the carrying handles and the mine towed very gently, from a distance of at least 100 yards, to a suitable demolition site.

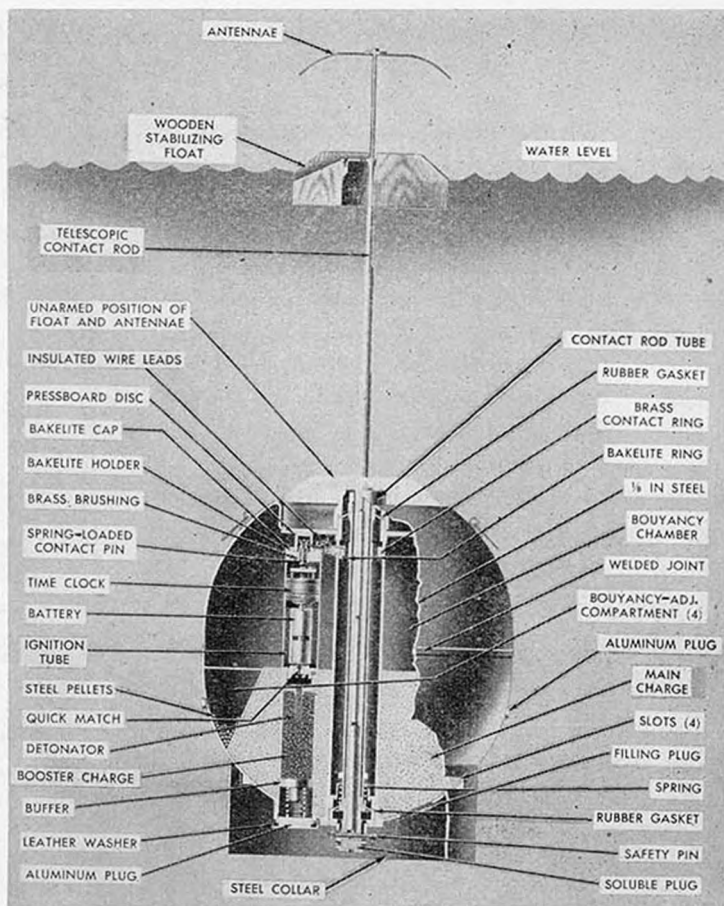
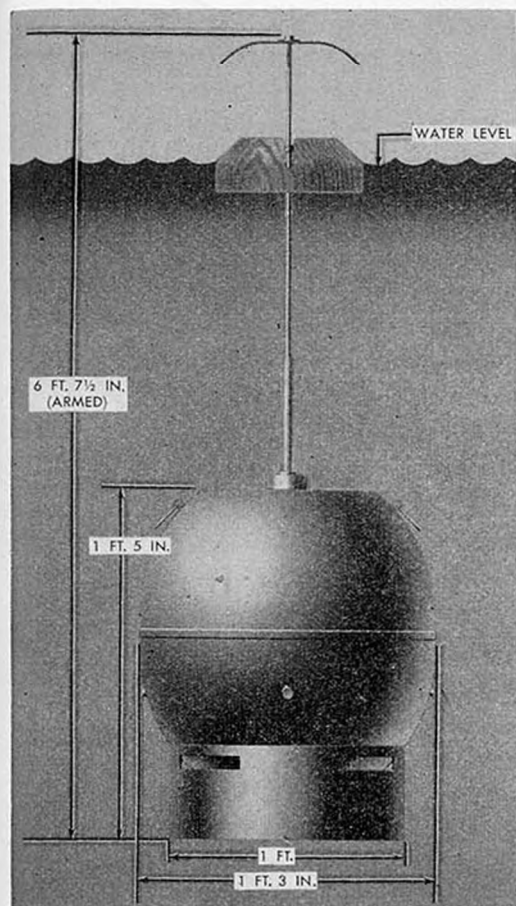


Figure 148. Spherical drifting mine 41.

*f. Packing.* The mines are packed and shipped individually. Fuzes are packed in containers, separate from the mines.

## 118. Improved River Mine (Behelfs-Flusstreibmine)

*a. Description.* The improvised river mine (fig. 149) consists of a circular sheet-zinc case containing 44 pounds of explosive. The sheet-zinc case is 15 inches in diameter and 5 inches high, but when surrounded by its wooden jacket it is 17 $\frac{3}{4}$  inches in diameter and 6 $\frac{1}{4}$  inches high. Two carrying handles are attached to the wooden jacket. Near the bottom of the sheet-zinc case are two small, metal detonator tubes, diagonally opposite each other and closed by screws or leather plugs. Detonators are inserted to permit activation when the mine is to be used as a land mine.

(1) *Firing mechanism.* A wooden contact rod about 4 $\frac{1}{2}$  feet long, with antennae

at the top, is mounted vertically on a wooden flotation buoy. Six wooden feelers, each 13 inches long, extend from the wooden flotation buoy. The wooden flotation buoy is secured to a metal firing rod which extends from the centrally located contact firing mechanism and protrudes about 6 inches above it. The contact firing mechanism is mounted on a plate which screws into a well in the top of the sheet-zinc case. The joint between the metal firing rod and the contact firing mechanism is made watertight by a rubber washer.

(2) *Fuze mechanism.* A clockwork delay mechanism is mounted on the same plate as the firing mechanism and performs two functions. It arms the contact firing mechanism after 10 minutes, and it may explode the mine after a preset delay of from 10 minutes to

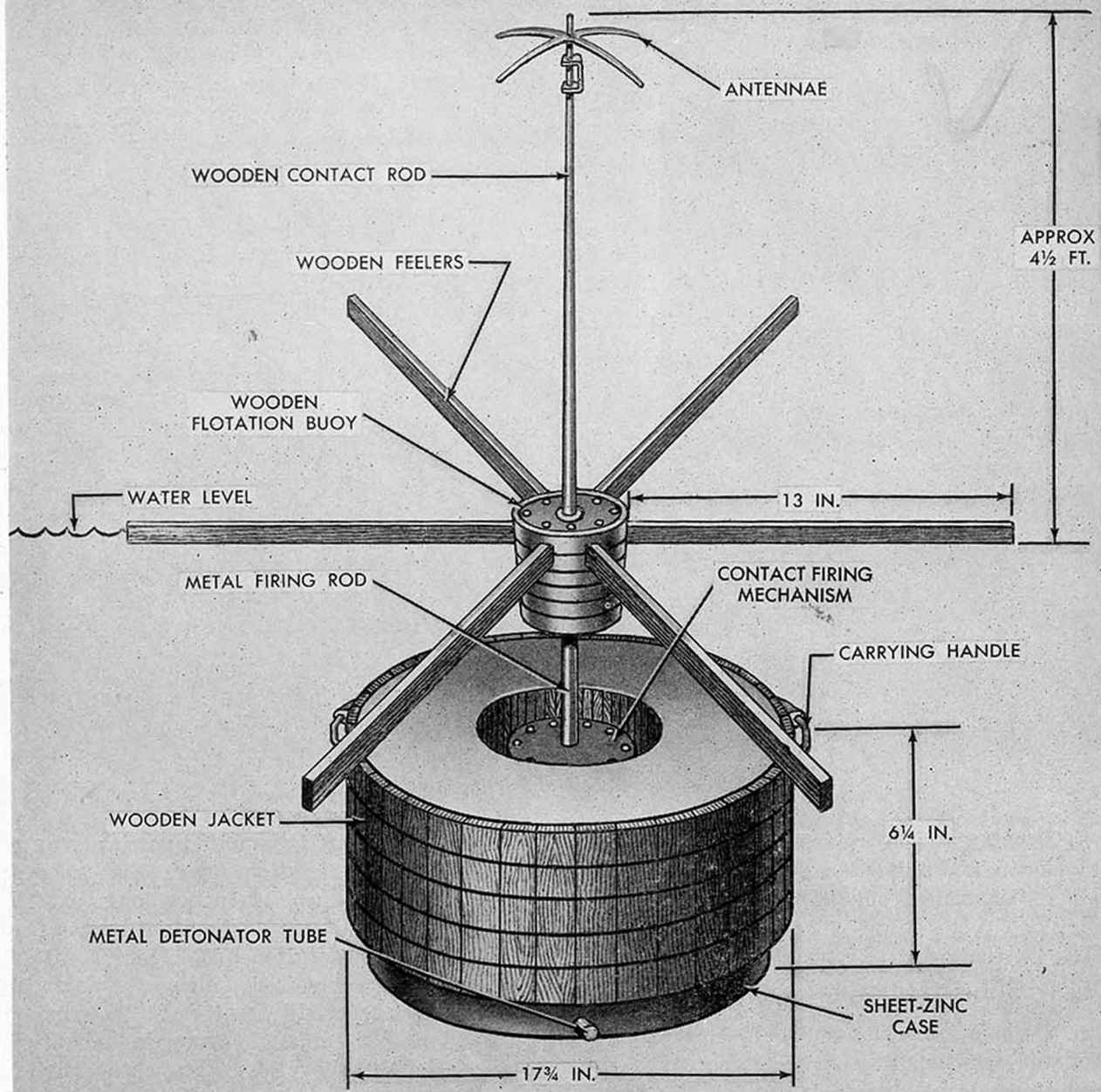


Figure 149. Improvised river mine.

6 hours, in case the mine has not been detonated by contact by that time. The clockwork delay mechanism is wound by turning a winding ring on the plate in the direction of the arrow marked *aufziehen* (to wind). The self-destruction delay period is set by turning a spring handle on the plate in the direction of the arrow marked *Zündung in Std* (firing time in hours). A

setting dial with graduation marks, each equal to 6 minutes, may be seen through a celluloid window. The delay arming mechanism is set (up to 10 minutes) by turning a second spring handle in the direction of the arrow marked *Scharf in Min* (arming time in minutes).

- (3) *Arming lever*. A curved arming lever, mounted on the plate, serves to release



the clockwork delay mechanism. In the safe position, the end of the lever enters a groove marked *sicher* (safe). In the armed position, the end of the lever enters a groove marked *scharf* (armed), in which case the clockwork will be running.

b. *Employment.* This mine is designed primarily for use against bridges, rafts, shipping, and similar targets.

c. *Functioning.* Any sideward movement against the antennae or wooden feelers is communicated to the metal firing rod. The base of the firing rod pushes against the bushing of a spring-loaded striker. This allows a metal tongue to retract, releasing the striker against the percussion cap.

d. *Neutralizing.* This mine cannot be neutralized because of the very delicate mechanisms. Extreme care should be taken to avoid touching the antennae or the wooden feelers.

The mine should be destroyed either by small arms fire or by a rocket launcher aimed at the wooden flotation buoy. Another method is to stretch a rope or wire across the stream downstream from the mine so that the mine will drift into it. If a bridge or other vital installation is threatened by a mine which is lodged against it but still afloat, a line may be attached to one of the carrying handles and the mine towed very gently, from a distance of at least 100 yards, to a suitable demolition site. Since the attachment of the line to the carrying handle will be an exceedingly dangerous operation because of the presence of the wooden feelers, this method should be adopted only in extreme cases.

**Caution:** The mine may also detonate according to the setting on the 6-hour clockwork delay mechanism. Once started, the clockwork delay mechanism cannot be stopped by turning the curved arming lever back to *sicher* (safe).

## Section II. TRAINING MINES

### 119. General

The German Army had a practice or training mine for the Tellermine 35, for the S-mine 35,

and for the concrete stake mine, the earliest standard German mines. Later standard German mines did not have any practice or training models.

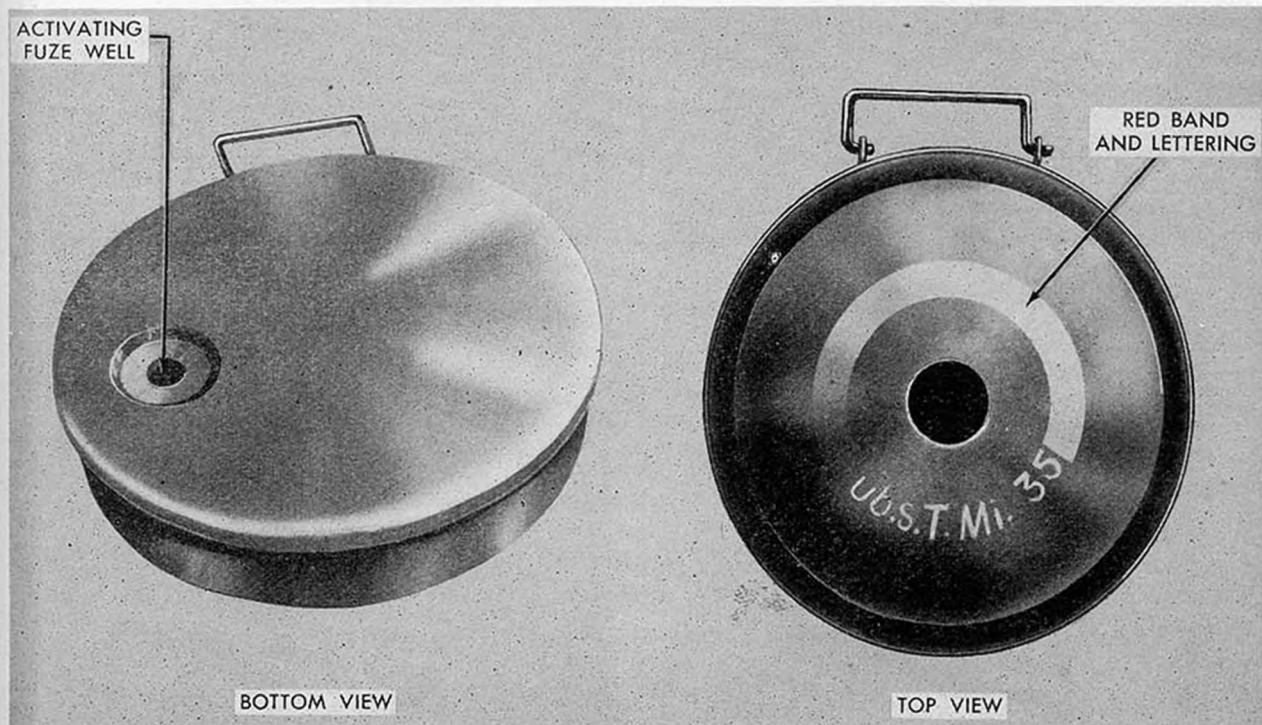


Figure 150. Training Tellermine 35.

## 120. Training Tellermine 35 (Übungs Tellermine 35)

The training Tellermine 35 (fig. 150) is similar in appearance to the Tellermine 35 (par. 62), except that it has a red band and the letters *Übs. T.Mi. 35* painted on the top. This mine is of heavier construction than its standard counterpart, the empty case weighing 19 pounds. High explosive is not used; the usual filling is a smoke powder.

## 121. Training S-Mine 35 (Übungs S-Mine 35)

The training S-mine 35 (fig. 151) is similar in appearance to the standard S-mine 35 (par. 85). The filling is of inert material such as sand or chalk. A wooden-cased smoke charge is placed in the mine to act as a main charge. This mine is marked with a red band; the letters *Übs. S.Mi. 35* are painted on the side.

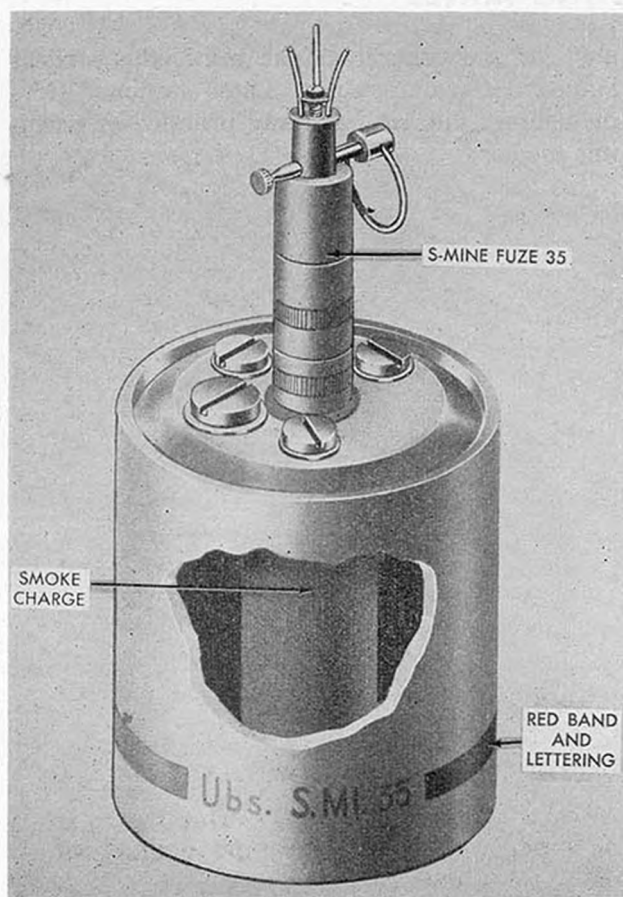


Figure 151. Training S-mine 35.

## 122. Training Stake Mine (Übungs Stockmine)

The training stake mine (fig. 152) is identical to the concrete stake mine (par. 87) except that the bore-hole charge and the detonator are replaced by a wooden-cased smoke charge. The fuze is the same as that used in the standard model.

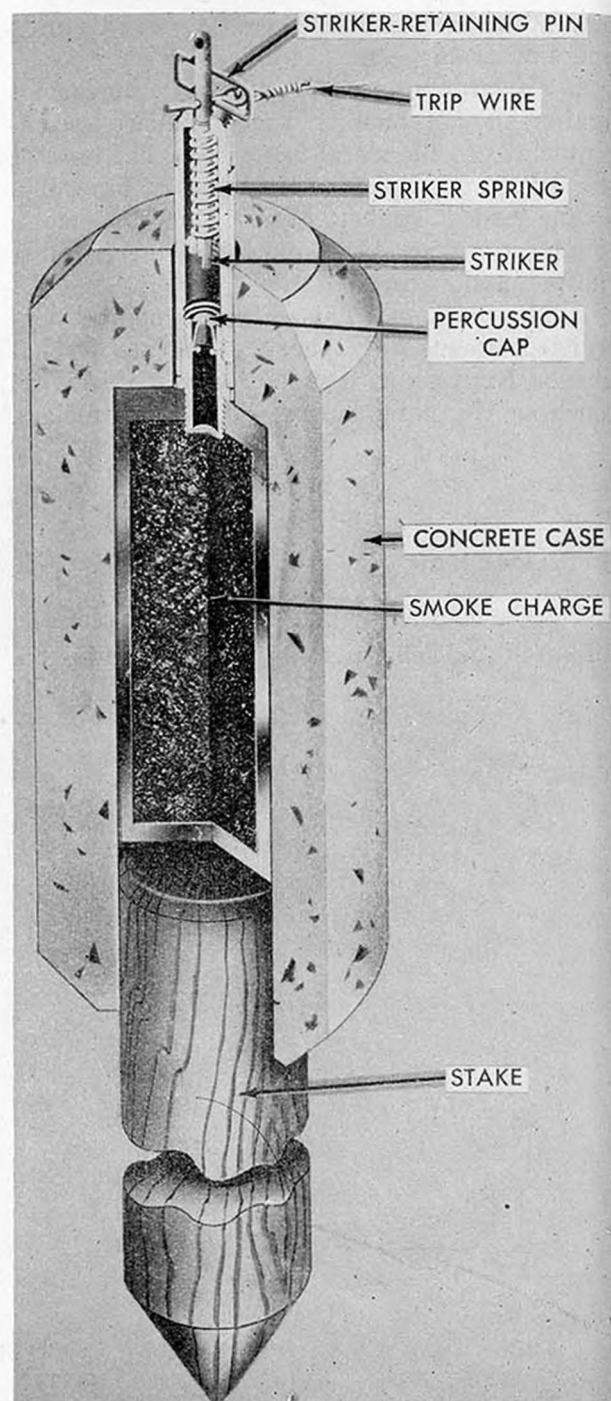


Figure 152. Training stake mine.

## CHAPTER 9

### MINE DETECTING EQUIPMENT

#### Section I. MINE PROBES

##### 123. Metal Mine Probe (Sucheisen)

The metal mine probe (fig. 153) is about 1 foot long with one end bent into a circular handle and the other end tapered to a fine point.



OVERALL LENGTH 1' TO 1'-4"

Figure 153. Metal mine probe.

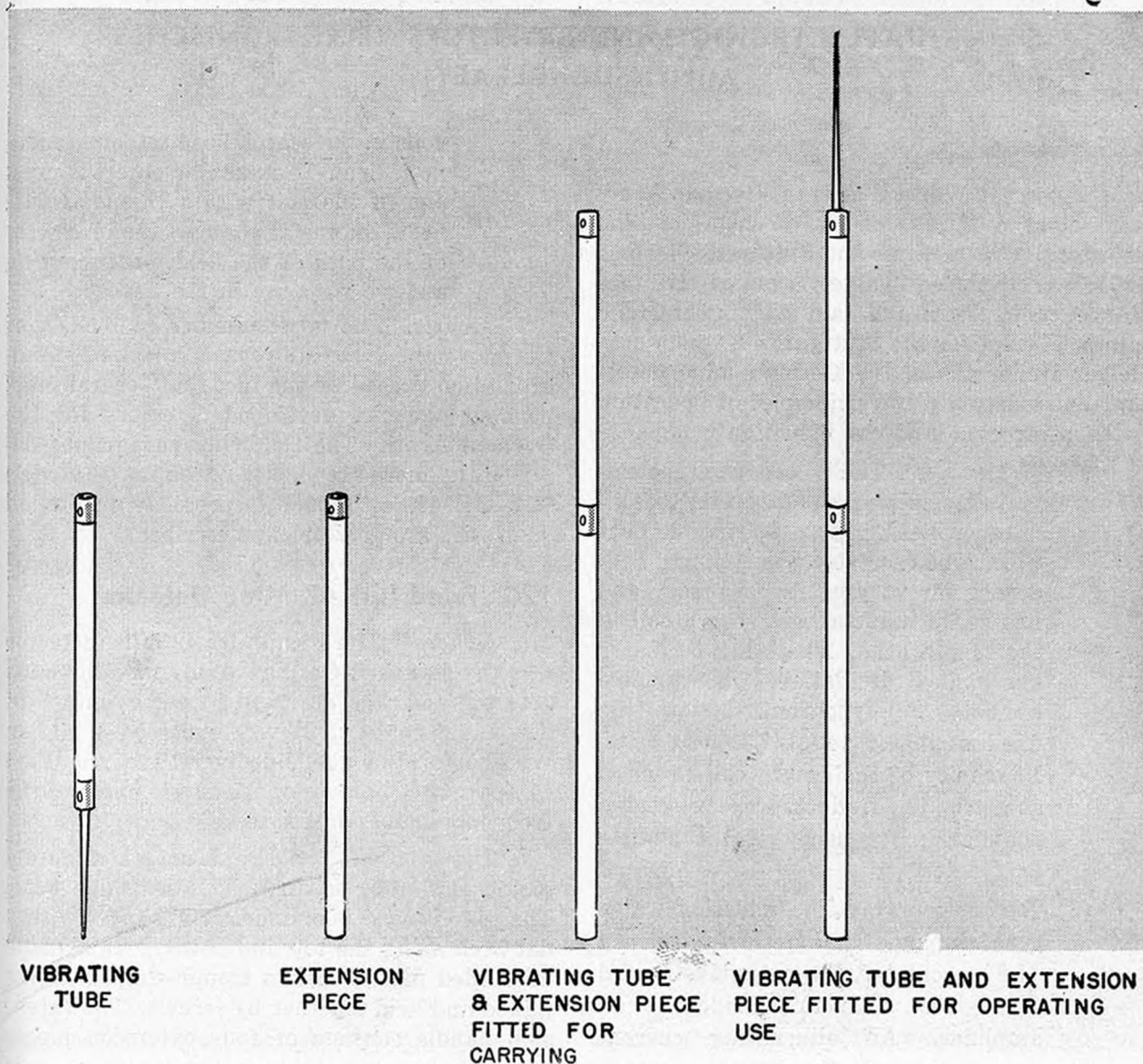


Figure 154. Mine probing rod 39.



## 124. Mine Probing Rod 39 (Minensuchstab 39; M.S. 39)

a. *Description.* The mine probing rod 39 (fig. 154) consists of an extension piece and a vibrating tube containing a hardened steel point. The extension piece is joined to the vibrating tube by means of a bayonet fitting, when the probing rod is to be used from the standing position. The total weight of the assembled probing rod is about 1 pound. In shipping and for carrying, the point is inserted in the extension piece.

b. *Operation.* The rod is held lightly between

the fingers and thumb and inserted vertically into the ground. If resistance is encountered, the point should be lifted approximately 4 inches above the ground and dropped again at the point where the resistance was encountered. A skilled operator can tell the nature of the object contacted by the action of the rod and by the sound emitted by the vibrating tube. The point will stick in wood and the vibrating tube will emit a dull note which will be barely audible. Metal will cause the rod to rebound and give out a high note. Rock causes the rod to rebound sharply and to produce a high, almost shrill note.

## Section II. ELECTRONIC MINE DETECTORS (ELEKTRONISCHES MINENSUCHGERAET)

### 125. General

a. *Types.* In World War II the German Army used eight different models of metallic mine detectors. One of these the Stuttgart 43 (par. 133), was developed to detect a radioactive substance called *Tarnsand* laid with nonmetallic mines. Except for the Stuttgart 43, which uses Geiger-Müller tubes, the German mine detectors represent only two principles of operation—the heterodyne and the induction bridge.

(1) *Heterodyne.* The heterodyne type employs two high-frequency (HF) oscillators which produce an audible beat note. One oscillator has a tuning condenser for varying its frequency and has as its inductance a search coil in the search head. The other oscillator has a fixed oscillation. The variable oscillator is synchronized with the fixed oscillator to give a beat note. Proximity of the search coil to metal changes the inductance, producing changes in frequency of the audible beat note.

(2) *Induction bridge.* The induction bridge type employs a single low-frequency (LF) oscillator, the output being fed through an induction bridge to an amplifier. An alternating current passed through the detector search

coils in the search head sets up a magnetic field. If a metallic object is present in the soil within this magnetic field, the metal changes the character of the path of the field, producing an audible response in the headset.

b. *Models.* The large number of models of German mine detectors reveals a lack of standardization caused by the fact that several independent agencies developed detectors for the German Army. The following paragraphs describe the more frequently encountered models in detail while the models produced in limited quantities are only briefly described.

### 126. Frankfurt 42 Mine Detector

a. *General.* The Frankfurt 42 mine detector was the standard German Army metallic-mine detector and was designed to detect mines of low metal content. It was superseded late in World War II by a modified version of the Wien 41 (par. 127) because of the development of the frequency-induction fuze.

b. *Description.* The Frankfurt 42 mine detector (fig. 155) is an induction bridge type. The search head is cylindrical in shape, with a flat area along the top and bottom. It is made of molded plastic in two trough-shaped halves joined and held together by screws. The extension handle consists of four extension pieces made of aluminum tubing. The lowest piece is

permanently attached by a bolt to the search head at the hinge bracket. This piece will collapse against the search head to facilitate packing. A canvas case is provided to store the extension pieces and search head when the detector is dismantled (fig. 156). The detector unit and power supply are housed in a black plastic pack case. The pack case is the standard German pack case used with most of the mine detector sets. The case measures 14 inches by 13 inches by  $4\frac{3}{4}$  inches. It is provided with a canvas carrying strap, and metal hooks for attachment of the pack harness. Access to the interior is provided by removing the end covers which are held in place by toggle clamps. The cover of the left-hand end bears the operator's printed instructions on its inner side. Removing this cover exposes the control panel for the detector set. At the bottom of the panel is the off-on switch. Above the switch is the nameplate, then the voltage tester and two 2-terminal sockets for headsets and one 3-terminal socket for a microphone. The voltage tester consists of a double window and a test button. When the detector set is switched on, and the test button depressed, both parts of the window should glow. If the voltage is low, only the lower part of the window will glow. A control box for sensitivity adjustment is also clipped into a socket on the control panel. The control-box cable plugs into this socket when the control box is detached and carried on the operator's belt. The search-head cable plugs into a

socket on the right-hand end of the pack case. Two standard headsets are included in the detector set. The entire detector set is stored in a wooden shipping case when not in use. The interior of the shipping case is divided by wooden partitions into compartments for the pack case, the search head and extension pieces in their canvas case, the pack harness, a spare battery, and spare electron tubes. The shipping case is provided with a folding metal handle to allow it to be carried suitcase fashion. The total weight of the detector set and shipping case is 54 pounds.

*c. Functioning.* The Frankfurt 42 detector functions on the induction bridge principle. A push-pull oscillator has as its inductance an iron-core coil in the search head. Another iron core in the search head is connected to the input of a two-stage audio amplifier. The output of this amplifier is fed to the headset. Normally, the voltage induced in the coils is very small. On approaching a metallic object, the condition in the coils is upset and allows a stronger signal to emerge from the amplifier.

*d. Operation.*

(1) *Assembling.*

- (a) Open the shipping case (fig. 157), keeping it nearly vertical, and remove the pack case. Keep the pack case standing upright. The battery tends to lose its electrolyte if it is not kept upright.

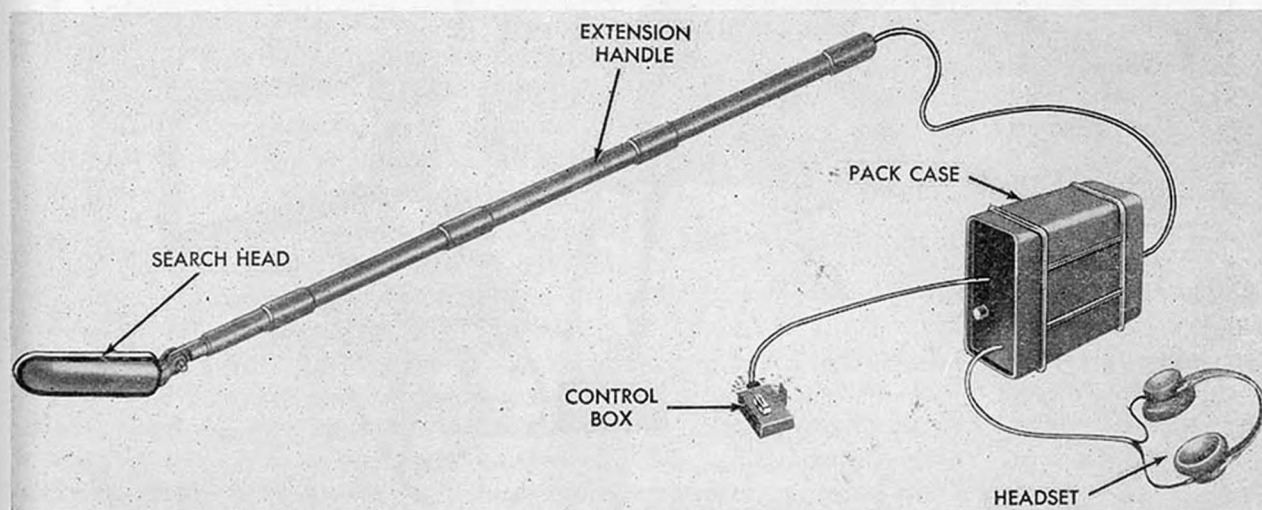


Figure 155. Frankfurt 42 mine detector.

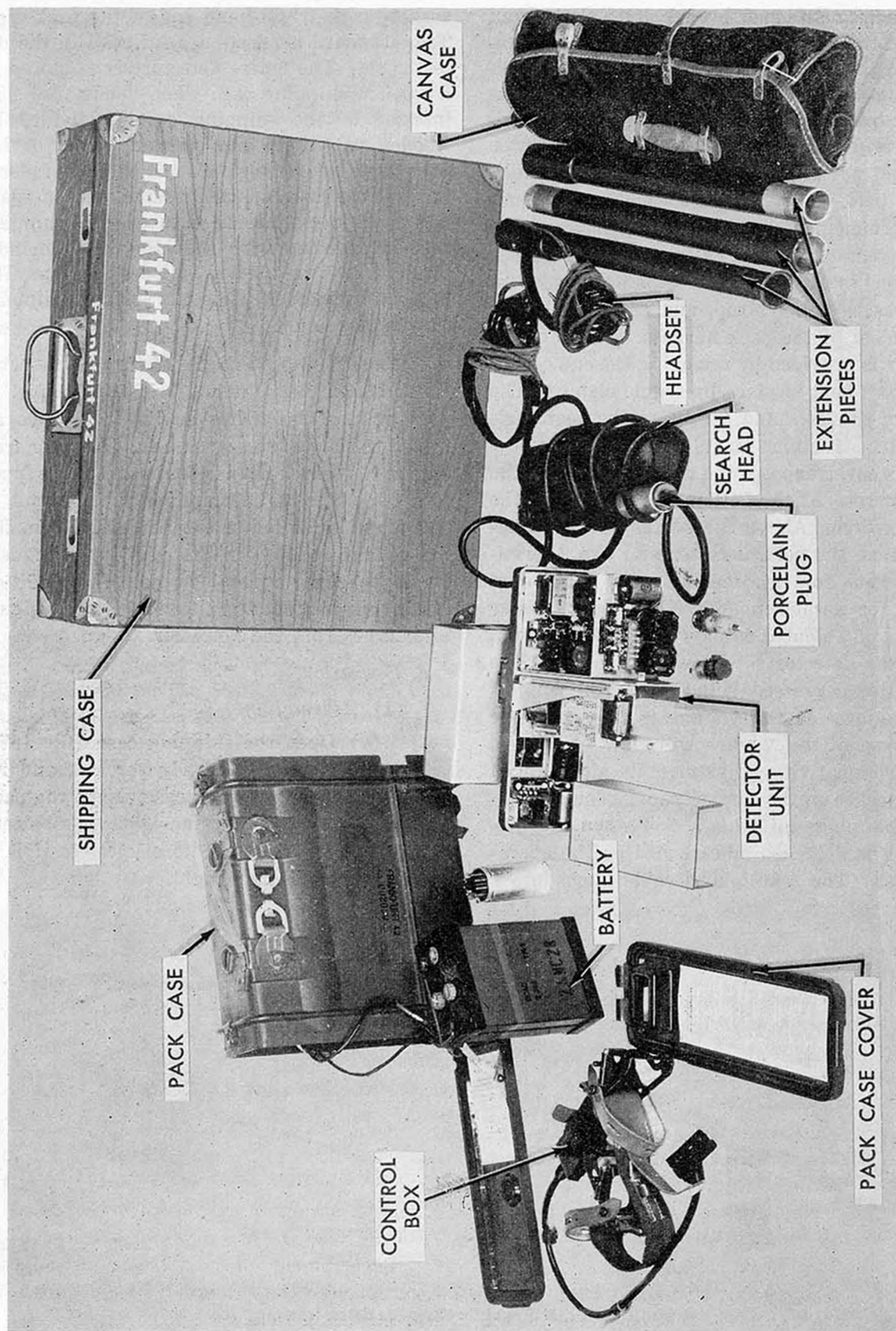


Figure 156. Components of the Frankfurt 42 mine detector.



- (b) Lay the shipping case down and remove the extension pieces and search head from their canvas case.
- (c) Thread the search-head cable through the extension pieces, starting with the sleeve end, and threading through the section with rim last.
- (d) Assemble the extension pieces and adjust the search head so it is horizontal in the sweeping position.
- (e) Plug the search-head cable into the socket inside the pack case on the side opposite the control panel and close the hinged cover.
- (f) Plug the headset into either socket labeled *Fernhörer*.
- (g) Remove the control box from the control panel and attach the male end of the control cable to its socket on the control panel.
- (h) Plug the female end of the control cable into the control box.
- (i) Attach the pack harness to the hooks on the pack case and place the pack case on your back.
- (j) Put on the headset.

(2) *Operating.*

- (a) Turn the off-on switch clockwise.
- (b) Turn the control knob on the control box until the yellow dot appears. A loud signal should be heard. The yellow dot indicates high sensitivity; the blue dot indicates low sensitivity; and the red dot intermediate sensitivity.
- (c) Hold the search head well clear of metal and the ground.
- (d) Remove the adjusting tool from the lowest extension piece and rotate the recessed heads on the sides of the search head, first one, then the other, until the signal is reduced to a barely perceptible level. Sensitivity can also be reduced by turning the control knob.
- (e) Test the sensitivity by bringing the wooden end of the test stick in contact with the bottom of the search

head. A noticeable increase in the signal level should be heard.

- (f) Commence sweeping, holding the search head 3 inches from the ground.

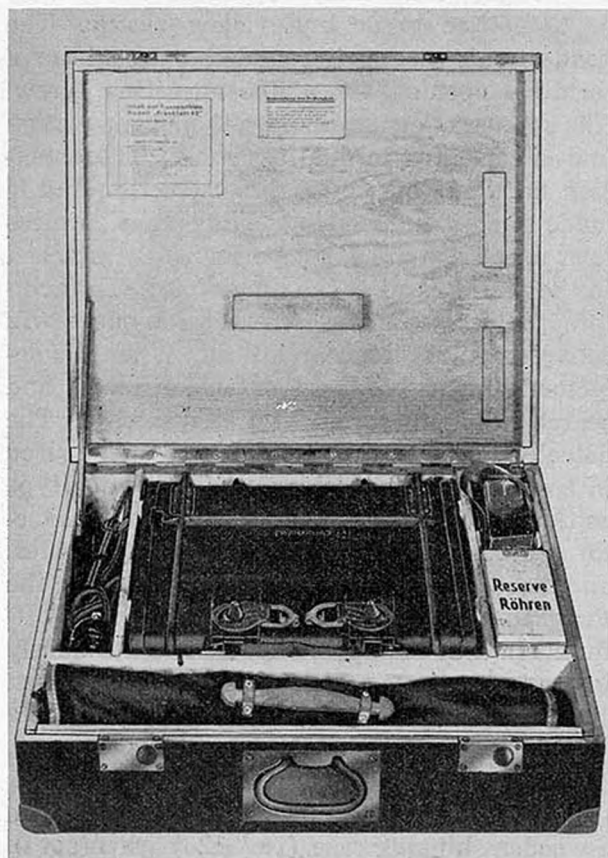


Figure 157. Shipping case for the Frankfurt 42 mine detector.

*e. Sensitivity.* The Frankfurt 42 detector, when properly adjusted, is one of the most sensitive of German mine detectors. It is very sensitive to small iron objects.

## 127. Wien 41 Mine Detector

*a. General.* The Wien 41 mine detector appeared in 1941. It was superseded in 1942 or 1943 by the Frankfurt 42 detector, the latter becoming standard for the German Army. In 1943 the Wien 41 was modified and, because of the development of the frequency-induction fuze, replaced the Frankfurt 42 detector as the standard mine detector.

*b. Description.* The Wien 41 mine detector (fig. 158) is an induction bridge type. The search head is cast in two cylindrical, plastic sections. The shorter of the two sections is blue-gray in color and has a hinge bracket for hinging the extension handle to the search head. The longer section may be of blue-gray plastic or a mottled green and yellow plastic. The head of this section is rounded and contains a terminal opening for a fine adjusting screw. The short section screws into the longer section and is cemented in final assembly. The extension handle is of sectional construction and is made of aluminum tubing. The extension piece next to the search head is permanently attached to the search head at the hinge joint. To facilitate packing, this lowest extension piece will collapse against the search head. When the detector is dismantled, the extension pieces and search head are stored in a canvas case. The detector unit and the power supply are housed in a standard plastic pack case, the same type as that used with the Frankfurt 42 mine detector (par. 126). The off-on switch, voltage tester, and headset sockets are the same as in the Frankfurt 42 detector. The control box is different in that the knob will rotate continuously instead of in three positions as in the Frankfurt 42 detector. The search-head cable plugs into a socket on the right-hand end of the pack case. Two standard headsets are included in the detector set. The entire detector set is stored in a wooden shipping case (par. 126) when not in

use. The total weight of the detector set and shipping case is 58 pounds.

*c. Functioning.* The Wien 41 mine detector functions on the induction bridge principle. The inductance of the oscillator circuit is a horizontal coil in the search head. At right angles to this coil another coil is mounted in the search head and is connected to the amplifier. The output of the amplifier is fed to a rectifier and to a variable resistor. The rectified output from the amplifier is fed to a trigger oscillator which gives an audible signal in the headset. On approaching a metallic object, the balanced condition in the coils in the search head is upset, producing an audible change in signal.

*d. Operation.*

(1) *Assembling.*

- (a) Open the shipping case, keeping it nearly vertical, and remove the pack case. Keep the pack case standing upright. The battery tends to lose its electrolyte if it is not kept upright.
- (b) Lay the shipping case down and remove the extension pieces and search head from their canvas case.
- (c) Thread the search-head cable through the extension pieces and assemble the extension handle.
- (d) Attach the pack harness to the pack case and sling it on your back making final adjustments for comfort.

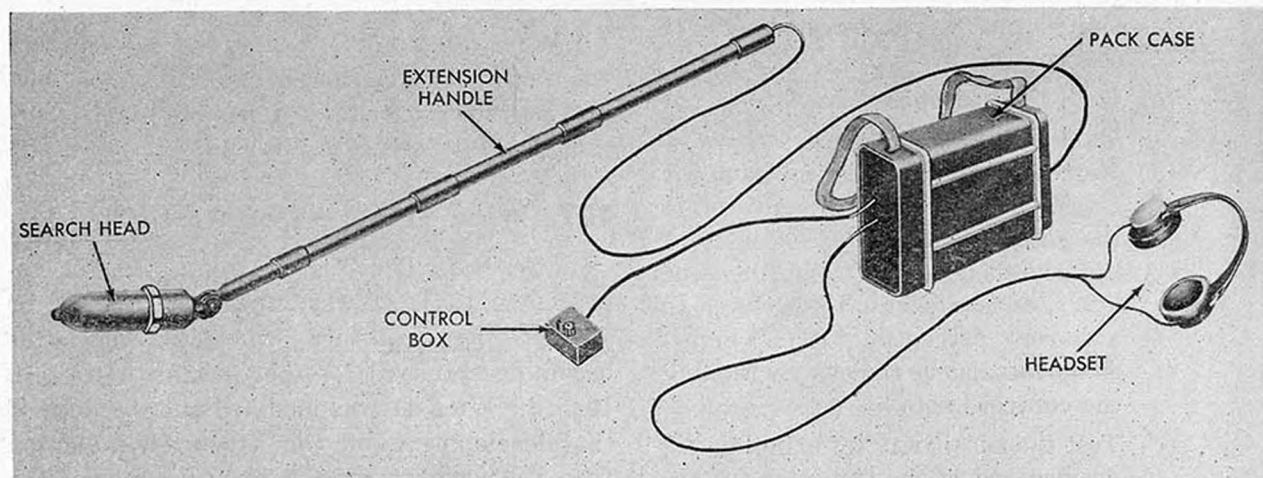


Figure 158. Wien 41 mine detector.

- (e) Plug the headset in the socket marked *Fernhörer*.
- (f) Remove the control box from the control panel and hook it on your belt.
- (g) Remove the fiber tool from the control panel and replace the panel cover.
- (h) Lift the small metal flap on the right side of the pack case, and insert the plug of the search head cable into the exposed socket.

(2) *Operating.*

- (a) Turn the off-on switch on the control panel to the *on* (EIN) position.
- (b) Hold the search head away from the ground and any metallic objects.
- (c) Set the knob on the control box so the red dot shows.
- (d) With the fiber tool, turn the adjusting screw at the toe of the search head until a minimum or null signal is obtained.
- (e) Turn the knob on the control box clockwise until a maximum signal is obtained.
- (f) Readjust the adjusting screw on the search head until a minimum or null signal is obtained.
- (g) Continue steps (e) and (f) above until it is no longer possible to obtain a minimum or null signal.
- (h) Turn the knob on the control box slightly counterclockwise and adjust the adjusting screw until a minimum or null signal is obtained.
- (i) Continue step (h) above until it is no longer possible to obtain a minimum or null signal.
- (j) Advance the knob on the control box until a maximum signal is obtained.
- (k) The detector set is now adjusted for normal setting. If the knob on the control box is turned counterclockwise, a small-objects setting can be obtained. In this condition, the detector is more sensitive to small

metal objects and less sensitive to large metal objects.

*e. Sensitivity.* The Wien 41 detector is difficult to adjust for maximum sensitivity, and also difficult to keep in adjustment. When set for maximum sensitivity, there is a high-pitched note in the headset. With small-objects sensitivity, the detector will be silent until the object is very close.

## 128. Neptun Mine Detector

The Neptun mine detector (fig. 159) is a heterodyne type. It was one of the earliest detectors of this type to be developed by the Germans. The set is characterized by a 6-foot 10-inch aluminum extension handle with a pivoted, circular, ring-shaped search head. The oscillator circuits are housed in an aluminum case attached to the extension handle. During operation, the detector is carried by a web strap worn over the shoulder. As is characteristic of most heterodyne detectors, this detector has good sensitivity to large metallic objects and poor sensitivity to small metallic objects.

## 129. Aachen 40 Mine Detector (Type B VRG 1940)

The Aachen 40 mine detector is a heterodyne type very similar to the Neptun mine detector (par. 128). Because of the similarity, the Aachen 40 is believed to be an improved model of the Neptun. The extension handle is in three pieces, making this detector more easily carried than is the Neptun. The uppermost extension piece has a housing for a tuning condenser. Like the Neptun mine detector, the search head is in the form of a circular ring with a square cross-section. The detector unit and the battery are contained in an aluminum case. The Aachen 40 mine detector is superior in sensitivity to the Neptun and it also has a louder, more stable signal.

## 130. Berlin 40 Mine Detector, (Type B)

The Berlin 40 mine detector, type B (fig. 160) is a heterodyne type. It is characterized by a rectangular search head attached to a four-piece extension handle. The detector unit is housed in a plastic pack case. During operation, the pack case may be worn over the shoulder



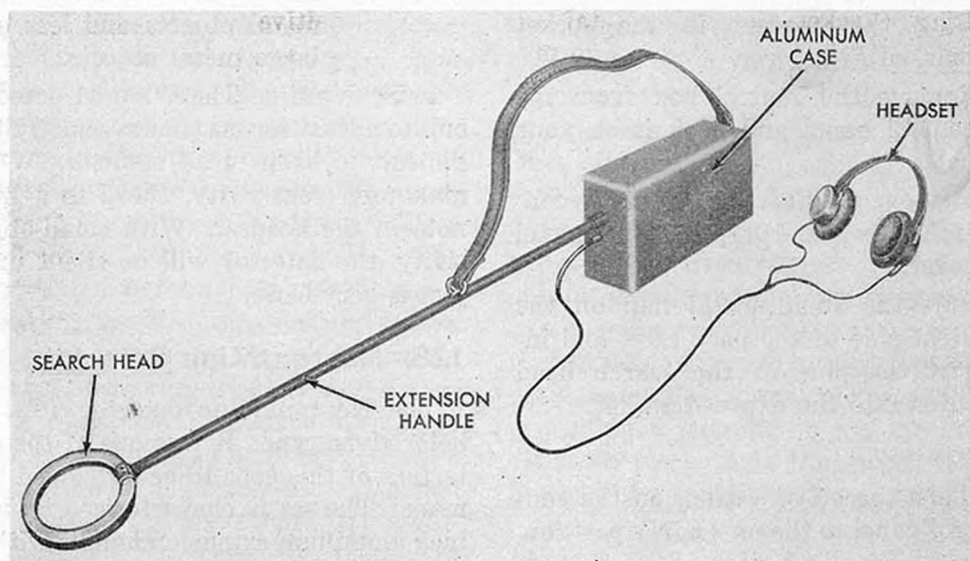


Figure 159. Neptun mine detector.

or attached directly to the extension handle. The Berlin 40, type B is superior in design and sensitivity to the Neptun and the Aachen mine detectors (pars. 128 and 129).

### 131. Tempelhof 41 Mine Detector

The Tempelhof 41 mine detector (fig. 161) is a heterodyne type. It has a spade-shaped plastic search head. At the rear of the search head an oscillator is housed in a cylindrical container. A four-piece extension handle is hinged

to the search head at the base of this cylinder. The control box is unusual in that it is situated on the search-head cable between the extension handle and the pack case. The detector unit is housed in a sheet-metal pack case which is smaller than the standard German pack case (par. 126). As is the case with most of the heterodyne German detectors, the Tempelhof 41 has good sensitivity for large metallic objects but poor sensitivity for small metallic objects.

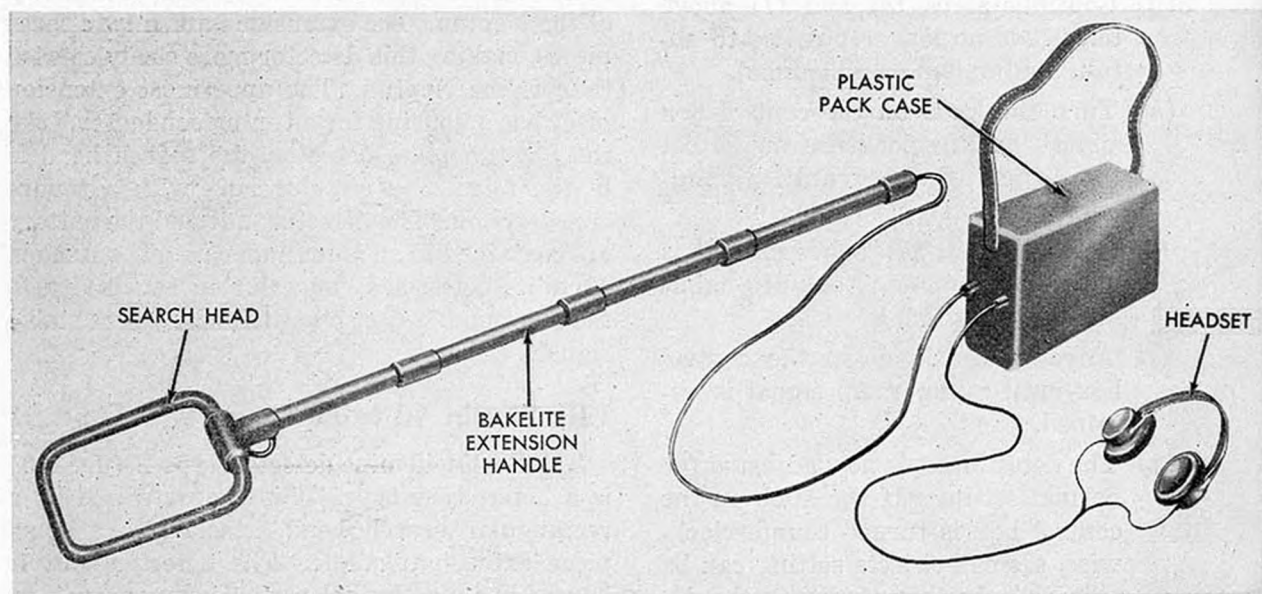


Figure 160. Berlin 40 mine detector, type B.

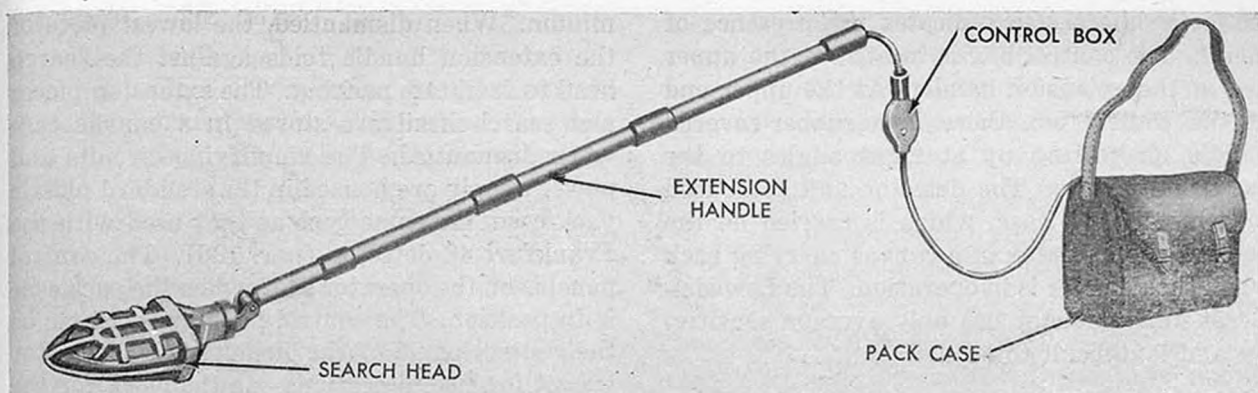


Figure 161. Tempelhof 41 mine detector.

### 132. Lowedel-Gerät Mine Detector

The Lowedel-Gerät mine detector (fig. 162) is a modification of the induction bridge type. It operates on the principle of self-inductance rather than mutual inductance. The search head is a flat plate, elongate-oval in shape. A special search head is also issued with the set. It is circular and ring-shaped with inner por-

tions removed to decrease the weight. A triangular bracket at the rear of each search head provides for attachment of the extension handle. Instead of a hinge joint at this bracket, two holes are provided to give a choice of angles for the extension handle. The extension handle is in three pieces. In addition to the headset, a visual balance indicator housed on the middle

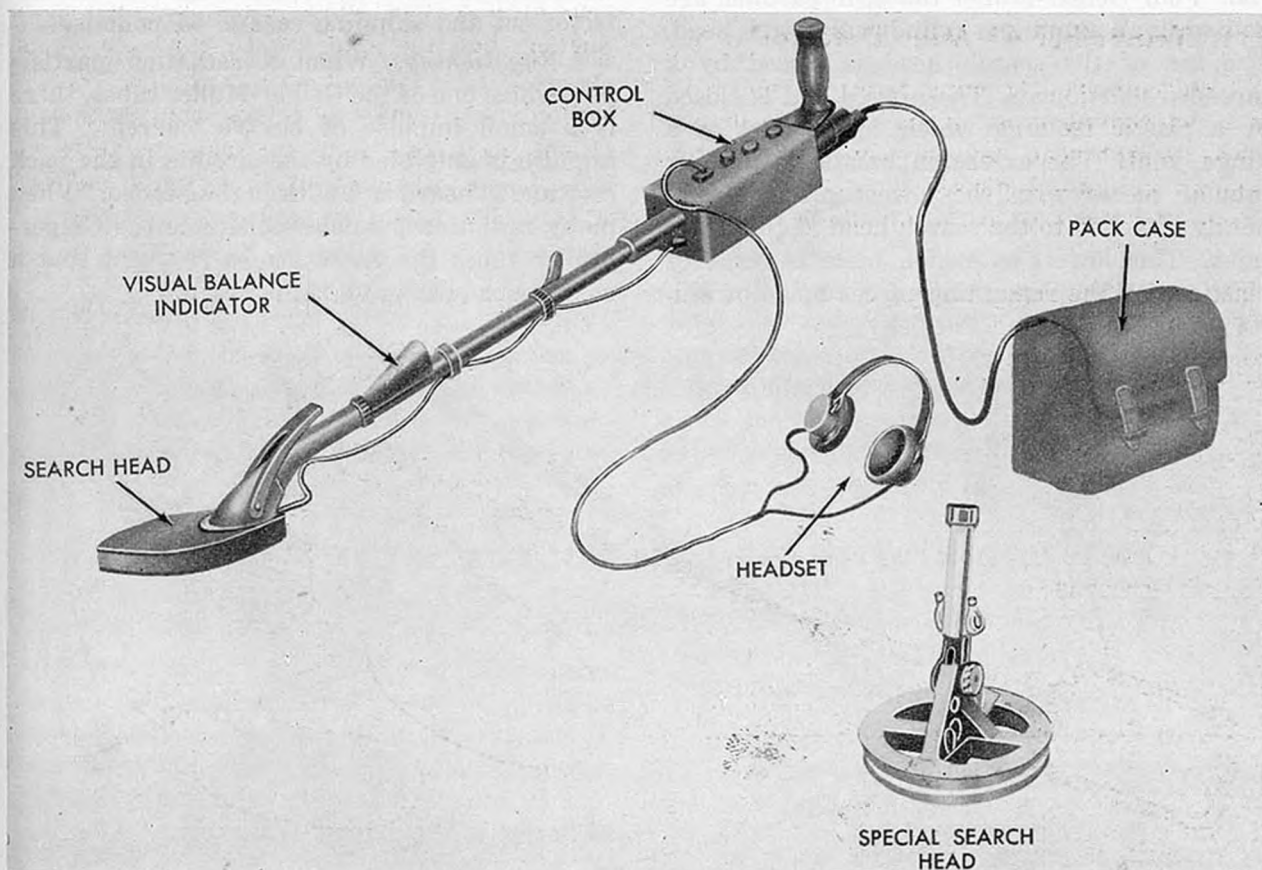


Figure 162. Lowedel-Gerät mine detector.

extension piece also indicates the presence of metal. The control box is located at the upper end of the extension handle. At the upper end of the control box there is a rubber-covered handle, projecting up at right angles to the extension handle. The detector unit is housed in a metal pack case, which is carried on the back of the operator in a canvas carrying sack when the detector is in operation. The Lowedel-Gerät mine detector has only average sensitivity and is difficult to adjust.

### 133. Stuttgart 43 Mine Detector

*a. General.* The Stuttgart 43 mine detector is not a detector of mines, as such, but only a locator of a radioactive material. It was frequently used to locate the nonmetallic Topfmines (par. 75) that had been laid with Tarnsand, a radioactive substance.

*b. Description.* The Stuttgart 43 mine detector (fig. 163) is an adaptation of the Geiger-Müller counter used to locate radioactive material. Four Geiger-Müller tubes, in parallel, are housed in an aluminum cylindrical search head. The toe of the search head is closed by a threaded plastic cap. The hinged end is closed by a plastic molding which forms part of a hinge joint. The extension handle is in four tubular pieces with the lowest piece permanently attached to the search head at the hinge joint. This lowest extension piece is made of plastic with the remaining pieces made of alu-

minum. When dismantled, the lowest piece of the extension handle folds against the search head to facilitate packing. The extension pieces and search head are stored in a canvas case when dismantled. The amplifying circuits and power supply are housed in the standard plastic pack case, the same type as that used with the Frankfurt 42 detector (par. 126). The control panel is on the operator's left when the pack case is in position. The control panel is the same as the control panel of the Frankfurt 42 detector except for two alterations—in the block for the headset sockets, the two upper sockets have been removed and a knob, labeled Temperaturregler (temperature regulator), for the high tension (HT) voltage control to the Geiger-Müller tubes appears there; also, the search-head cable socket appears on the upper part of the panel. Two standard headsets are included in the detector set. A package of Tarnsand is included in the detector set for use in adjustment of the detector. The entire detector set is stored in a wooden shipping case (par. 126) when not in use. The total weight of the detector set and shipping case is 54 pounds.

*c. Functioning.* When a radiation particle penetrates one of the Geiger-Müller tubes, there is a small impulse of electric current. This impulse is amplified by the circuits in the pack case and is heard as a click in the headset. When many radiation particles penetrate the Geiger-Müller tubes the clicks are so frequent that a continuous buzz or signal is heard.

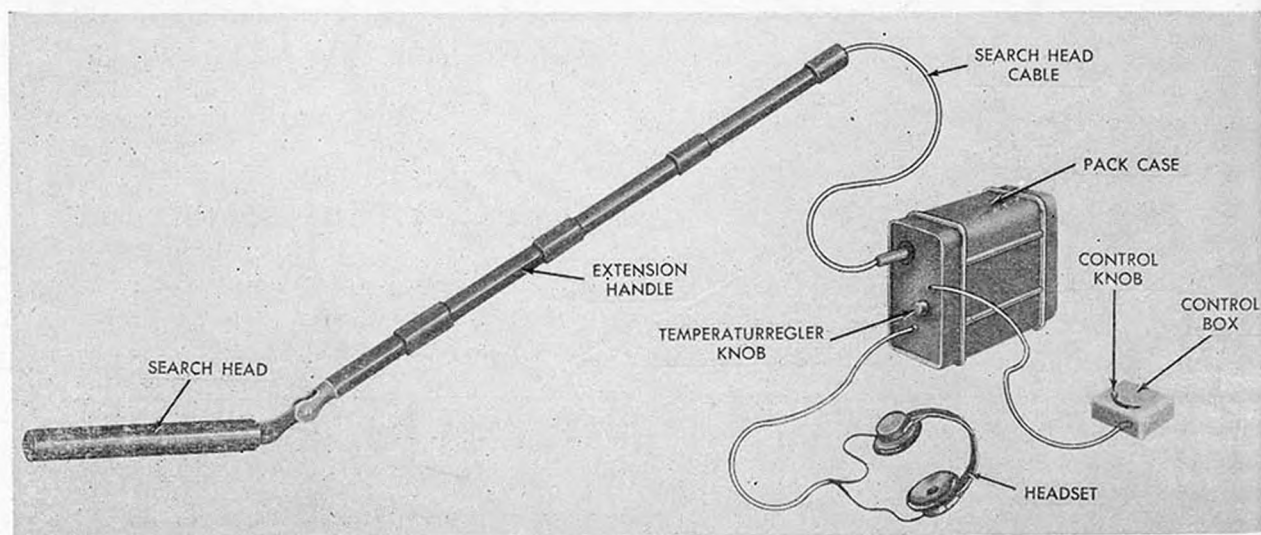


Figure 163. Stuttgart 43 mine detector.



d. Operation.

(1) Assembling.

- (a) Open the shipping case, keeping it nearly vertical, and remove the pack case. Keep the pack case standing upright. The battery tends to lose its electrolyte if it is not kept upright.
- (b) Lay the shipping case down and remove the extension pieces and search head from the canvas case.
- (c) Assemble the search head and extension handle.
- (d) Remove the left side cover of the pack case and insert the search-head cable plug into the rubber socket at the top of the control panel, holding the plug with the mark uppermost. Secure the plug by giving it a quarter-turn.
- (e) Plug the headset cable into the socket marked *Fernhörer*.
- (f) Attach the pack harness to the pack case.

(2) Operating.

- (a) Remove the measuring stick and the package of Tarnsand from the shipping case.
- (b) Turn the off-on switch to the *on* (EIN) position and test the voltage with the voltage tester.
- (c) Turn the knob labeled *Temperatur-regler* counterclockwise as far as it will go.
- (d) Set the knob on the control box so that the red dot is in the center of the opening. At this time random noises in the headset should be at a minimum.

- (e) Hold the search head horizontally over the Tarnsand at a distance of 28 centimeters (11 inches). Use the measuring stick to be sure of the distance.
- (f) Turn the knob *Temperatur-regler* clockwise until a strong, continuous signal is heard. A slight adjustment of the control knob may be necessary to get a stable signal.
- (g) Lift the search head; the signal should stop almost immediately.
- (h) With the controls so adjusted, turn off the detector and remove the search-cable plug.
- (i) Slide out the control box and headset cables beneath the hook on the rim of the pack case.
- (j) Replace the cover on the control panel and open the metal flap over the cable-plug hole. Push in the search-head cable plug and secure as before.
- (k) Put the pack case on your back with the pack harness, attach the control box to your belt, and put on the headset.
- (l) Pick up the extension handle and commence sweeping.

e. *Sensitivity.* Sweeping 8 to 10 inches above the ground will positively detect a Topfmine laid with Tarnsand. As the search head approaches a radioactive substance, frequent ticks will be heard in the headset. In close proximity the ticks will seem as a continuous signal. Do not be concerned about random ticks as these are caused by cosmic rays.

### Section III. ELECTRICAL-ACOUSTIC MINE DETECTING DEVICES

#### 134. General

During World War II the German Army developed and employed equipment designed to detect activities by amplifying vibrations in the ground. In some instances an electrical circuit for detonating mines by remote control was used in conjunction with these detection devices (par. 136). Although originally designed to detect tunneling activities, much of

this acoustic equipment was used satisfactorily to detect other activities such as the movements of vehicles and foot troops.

#### 135. Mine-Gallery Detector Set 40 (*Stollenhorchgerät 40*)

a. *General.* The mine-gallery detector set 40 is used to detect tunneling activities of an op-

posing force and to locate them by application of surveying methods. Vibrations picked up by the detector heads can be transmitted a maximum of 660 to 1,650 feet to the control post, where they are identified by trained operators.

*b. Component parts (table I).*

- (1) *Detector heads.* Two types of detector heads may be used with the mine-gallery detector set 40. They are the E 105a and the E 105c. Detector heads are piezoelectric receivers of ground vibrations. Since the electrical currents generated in the receiver are extremely small, a preamplifier in the detector-head unit amplifies them. The connection between the detector-head unit and the amplifier unit EVB 6 is made by a shielded four-core rubber detector-head cable. During shipment, the detector head is placed in the hollow axle of the cable drum. The E

105a detector head is held in this position by a tape, and the E 105c by a spring-loaded snap fastener which engages the carrying-handle lug.

- (a) *E 105a detector head.* The E 105a detector head (fig. 164) is a projectile-shaped unit, 33 inches long and 4 inches in diameter, designed for use in bore holes. It has a slightly narrowed sleeve at the rear, and a length of cable permanently connected to it. The piezoelectric element is located in the nose end and is held in place by retaining rings. Immediately behind the piezoelectric element is the vibrator mounted on the vibrator holders. The preamplifier, with the electron tube, is connected to the vibrator and the endpiece.

*Table I. Component Parts of the Mine-Gallery Detector Set 40*

*Using the E 105a detector head*

Equipment	Model	Quantity	Dimensions <sup>a</sup> (inches)	Weight <sup>b</sup> (pounds)
Cable drum	E 105a	10	36 by 21 by 21	160
Detector head				
660 feet of cable				
Drum stand, collapsible		10	26 by 20 by 6	24
Amplifier with 2 headsets	EVB 6	1 <sup>c</sup>	24 by 15 by 8½	81
Batteries	12 NC 28	2	11 by 10 by 7½	48

*Using the E 105c detector head*

Equipment	Model	Quantity	Dimensions <sup>a</sup> (inches)	Weight <sup>b</sup> (pounds)
Cable drum	E 105c	10	36 by 21 by 21	138
Detector head				
660 feet of cable				
Drum stand, collapsible		10	26 by 20 by 6	24
Pointed ends (boxed)		10	15 by 8 by 4	31
Amplifier with 2 headsets	EVB 6	1 <sup>c</sup>	24 by 15 by 8½	81
Batteries	12 NC 28	2	11 by 10 by 7½	48

<sup>a</sup> Total loading space:

Using the E 105a listening head: 114 by 61 by 22 inches

Using the E 105c listening head: 114 by 45 by 26 inches

<sup>b</sup> Total weight:

Using the E 105a listening head: 2018 pounds

Using the E 105c listening head: 1821 pounds

<sup>c</sup> Two amplifiers are required when the set is used in bore holes.

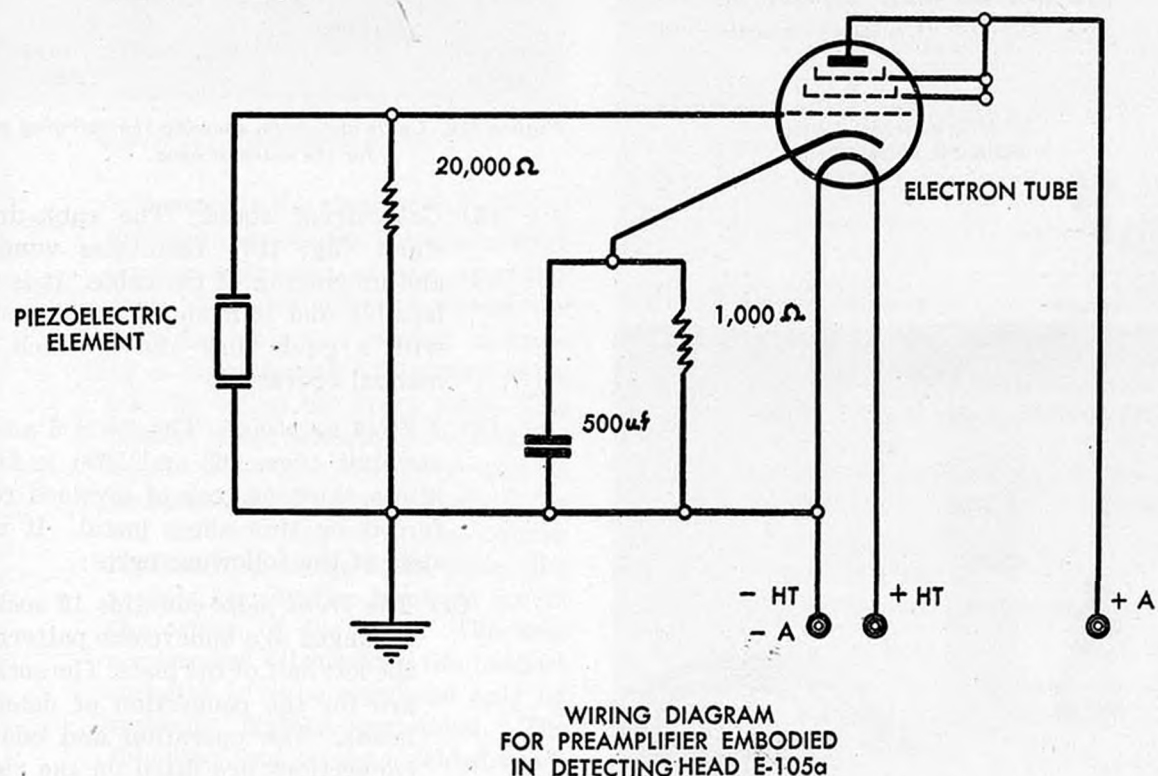
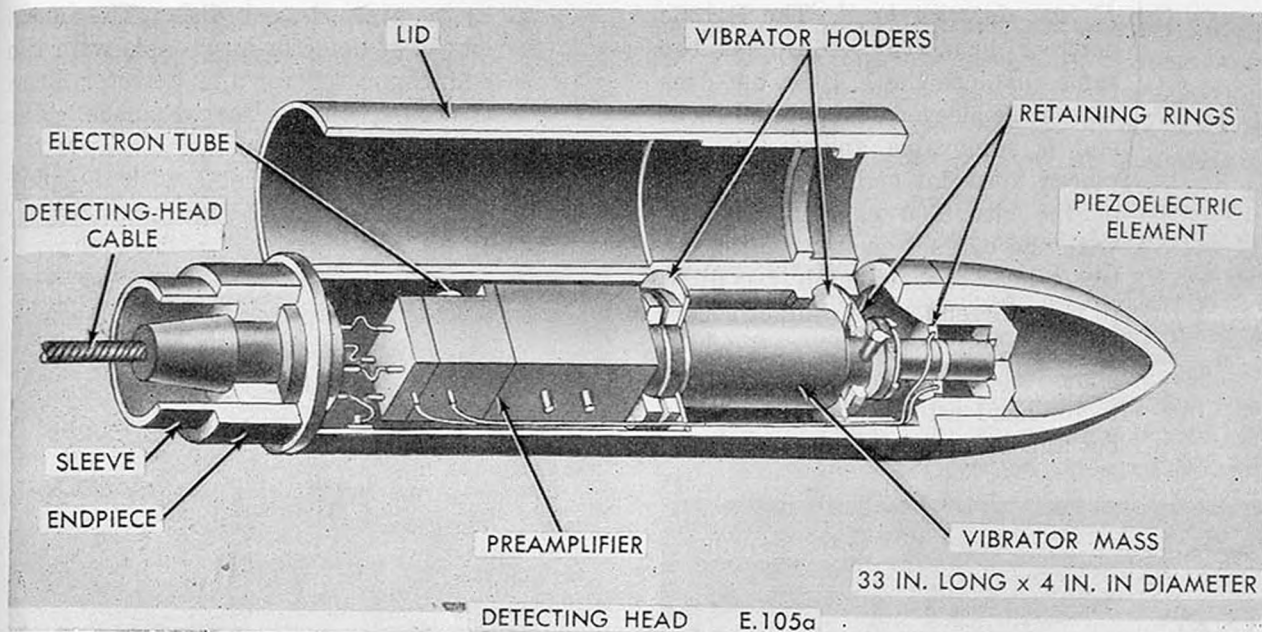


Figure 164. E 105a detector head.



- (b) *E 105c detector head.* The E 105c detector head (fig. 165) has the same shape as the E 105a, but does not have a sleeve. The pointed front end is removable and can be replaced by a flat endpiece. In place of the sleeve, a carrying handle, with the contact socket for the detector-head cable beneath it, is fitted to the rear end. The contact socket is protected by a screw cap, which should not be removed until the detector-head cable connection is laid out and prepared for insertion.

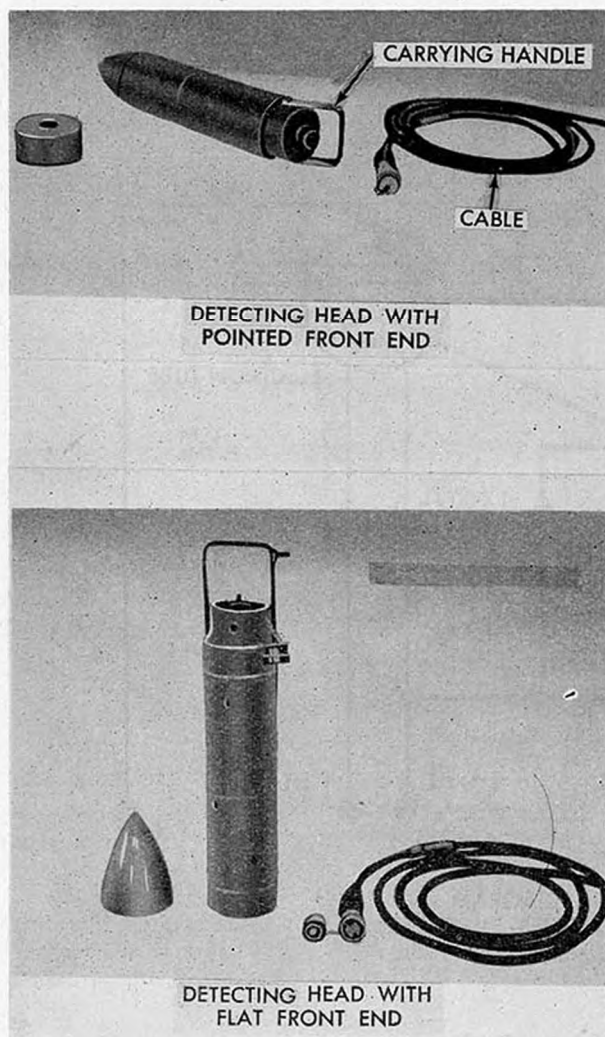


Figure 165. E 105c detector head.

- (2) *Cables and cable drums* (fig. 166). The cable drum has two winding compartments separated from each other

by a pressed-steel disk. The main length of detector-head cable with the end connector for the detector head is wound on the larger space. The smaller space has room for approximately 50 feet of cable with the plug connector for the EVB 6 amplifier.

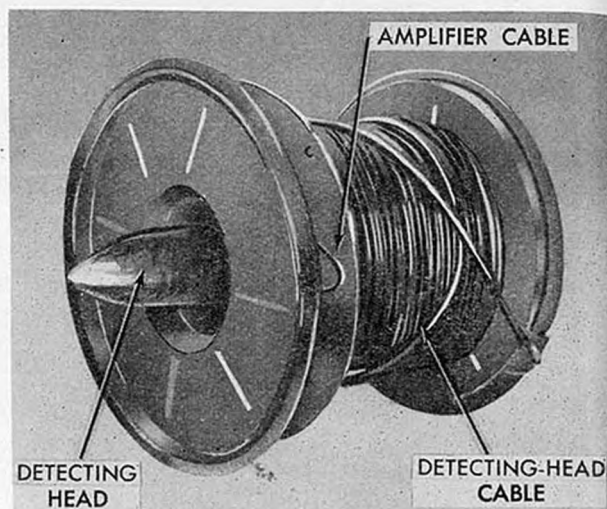
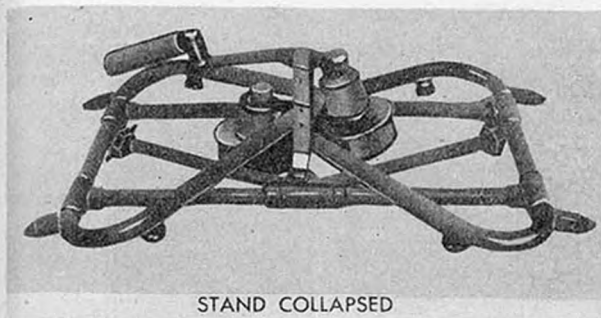
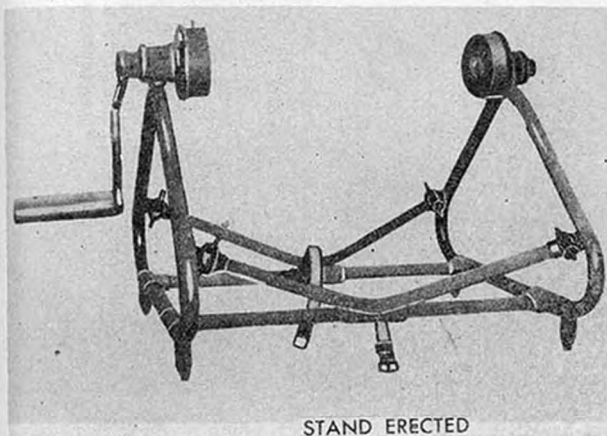


Figure 166. Cable and drum showing the carrying place for the detector head.

- (3) *Cable-drum stand.* The cable-drum stand (fig. 167) facilitates winding and unwinding of the cable. It is collapsible and is made of tubular steel with a guide disk and a clutch for manual operation.
- (4) *EVB 6 amplifier.* The EVB 6 amplifier unit (figs. 168 and 169) is fitted into a shipping case of plywood reinforced by thin sheet metal. It consists of the following parts:
- (a) *The front plate* contains 10 sockets arranged in a honeycomb pattern on the left half of the plate. The sockets are for the connection of detector heads. The operation and control connections are fitted on the right. The selector switch, on the top of the front plate, provides a connection with any one of the 10 detector heads. Underneath the selector switch is a volume control and, below that, the switch for the low-pass filter (200 cycles per second). A



STAND COLLAPSED



STAND ERECTED

Figure 167. Cable-drum stand.

voltmeter to the right of the selector switch indicates the battery voltage during operation of the amplifier unit. The connection between the amplifier unit and battery is made by a short length of battery cable leading out of the front plate. The control lamp, beneath the voltmeter, lights when the amplifier unit is switched on. The main switch for the unit is situated at the bottom right corner of the front plate; the sockets for the two headsets are in the center of the plate. The zero adjustment (just above the headset sockets) is to be regulated only by specially trained personnel. The shielding lead on the shielded headsets must always be plugged into the ground socket, immediately below the headset sockets.

- (b) Two headsets are kept in the side compartment of the shipping case.
- (c) The triangular box spanner fits the bolts which hold the amplifier front

plate by its four corners. These bolts are unscrewed to remove the amplifier unit from the shipping case. The spanner is kept in the side compartment of the shipping case.

- (d) The spare-parts box contains one vibrator, one stabilizer electron tube, one spare bulb for the control light, and one fuze. Three additional spare electron tubes are mounted inside the amplifier unit itself. The spare-parts box is kept in the side compartment of the shipping case.
- (5) 12 NC 28 battery. One 12 NC 28 battery is required for the operation of the 10 detector heads and the amplifier unit. This battery has an average voltage of 12 volts and a capacity of 28 ampere-hours.

c. *Functioning.* Ground vibrations received by the detector heads are transformed into electrical impulses and are transmitted to the amplifier EVB 6 where they are made audible through the headsets.

d. *Use in the Field.*

(1) *On the surface of the ground.*

- (a) Two men are required to set up the control post in the field. When the amplifier case has been opened and all the connections made, a slight hum, originating from the vibrator, can be heard in the headset. The heating period for the electron tube is approximately 30 seconds, after which the set is ready for operation.
- (b) The oscillator circuit must be inserted when the operator is listening for tunneling vibrations. This is indicated by a slight vibration which is audible when the set is on.
- (c) To test the detector heads before use, slide a hand over the detector head. A slight rustle should be heard through the headset.
- (d) Two men can fix the cable-drum stand to the drum, or demount it

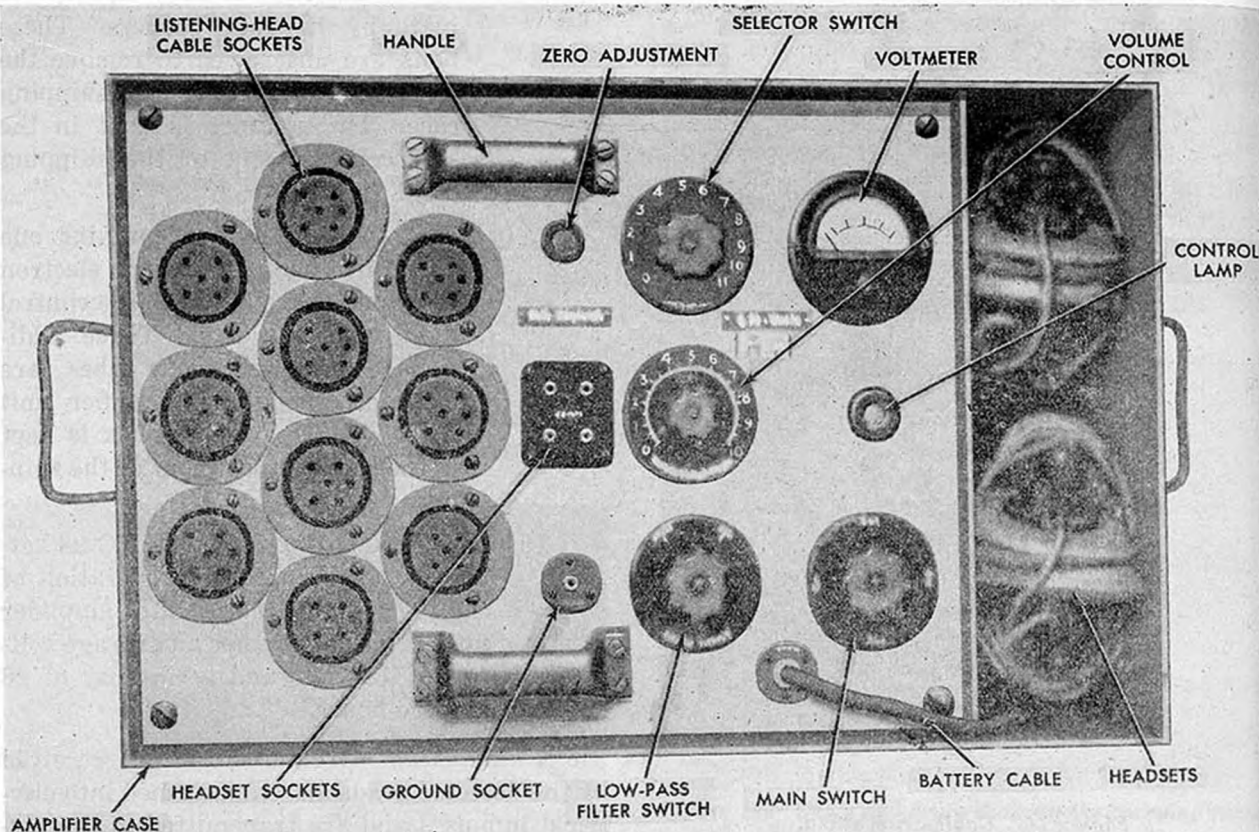


Figure 168. EVB 6 amplifier.

from the drum. Three men are required to unwind cable from the drum and to bring the detector head to its forward position.

- (e) The detector-head cable should be concealed and if possible, laid in ditches or along hedgerows. If the cable is laid in open country, particular care must be taken in camouflaging it. In trenches, detector-head cables are fixed on the side toward the opposing force by means of wooden pegs or iron clamps.
- (f) A hole 7 feet deep is required for each detector head to obtain a good detecting range with a comparatively small amount of interference noises.
- (g) After the detector head has been placed, it is checked to see that it makes a good solid contact with the surrounding soil.

**Caution:** The detector head may have antilifting devices attached (par. 114).

## (2) Underground.

- (a) When the mine gallery detector set 40 is used underground in a mine or tunnel, the detector heads are placed in bore holes dug with a mine boring machine. The setting up of the control post and use of cable drums and stands remain the same as for surface use. To obtain bearings, however, it is necessary to listen in on two detector heads simultaneously and to compare their reactions. A detecting control of this type consists of two harmonized amplifiers and two batteries. Of each pair of detector heads to be compared, one detector head is connected to each amplifier unit. The headsets are connected with one



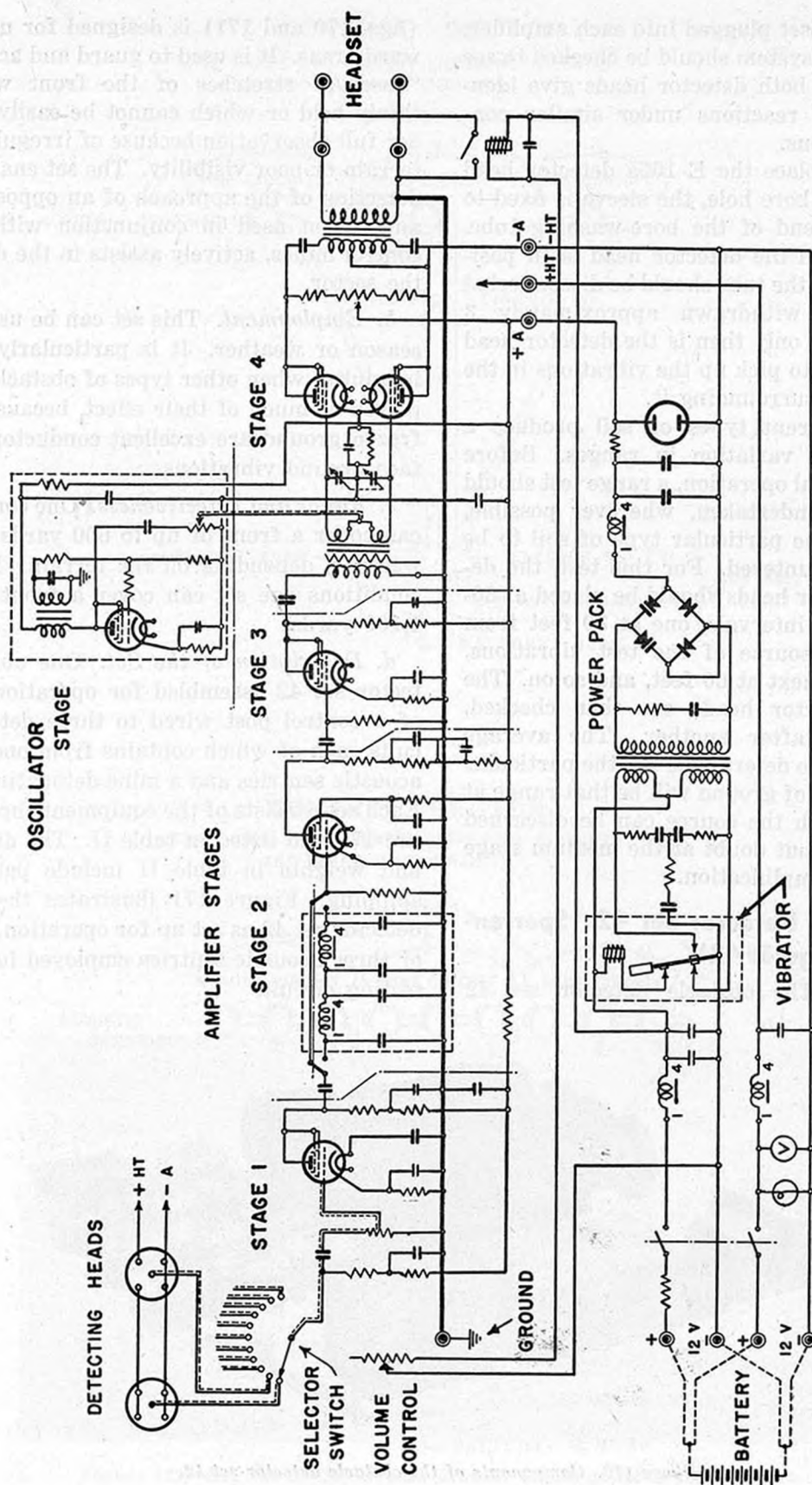


Figure 169. Wiring diagram for the EVB 6 amplifier.

headset plugged into each amplifier. The system should be checked to see that both detector heads give identical reactions under similar conditions.

- (b) To place the E 105a detector head in a bore hole, the sleeve is fixed to the end of the bore-washing tube. When the detector head is in position, the tube should be disconnected and withdrawn approximately 3 feet; only then is the detector head able to pick up the vibrations in the soil surrounding it.
- (c) Different types of soil produce a wide variation in ranges. Before actual operation, a range test should be undertaken, wherever possible, in the particular type of soil to be encountered. For this test, the detector heads should be placed at 30-foot intervals, one at 30 feet from the source of the test vibrations, the next at 60 feet, and so on. The detector heads are then checked, one after another. The average range determined for the particular type of ground will be that range at which the source can be discerned without doubt at the medium stage of amplification.

### 136. Obstacle Detector Set 42 (Sperrhorchgerät 42)

a. *Purpose.* The obstacle detector set 42

(figs. 170 and 171) is designed for use in forward areas. It is used to guard and acoustically "observe" stretches of the front which are thinly held or which cannot be easily kept under full observation because of irregularities of terrain or poor visibility. The set enables early detection of the approach of an opposing force and, when used in conjunction with remote-control mines, actively assists in the defense of the sector.

b. *Employment.* This set can be used in any season or weather. It is particularly valuable in winter, when other types of obstacles are deprived of much of their effect, because ice and frozen ground are excellent conductors of surface ground vibrations.

c. *Range and Effectiveness.* One complete set can cover a front of up to 600 yards in warm weather, depending on the terrain. In winter conditions one set can cover a front of up to 1,100 yards.

d. *Description of the Set.* One obstacle detector set 42 assembled for operation consists of a control post wired to three detector circuits each of which contains from one to three acoustic sentries and a mine-detonating circuit. Each set consists of the equipment shown in figure 170 and listed in table II. The dimensions and weights in table II include packing for shipping. Figure 171 illustrates the obstacle detector set 42 as set up for operation, with one or three acoustic sentries employed in each detecting circuit.

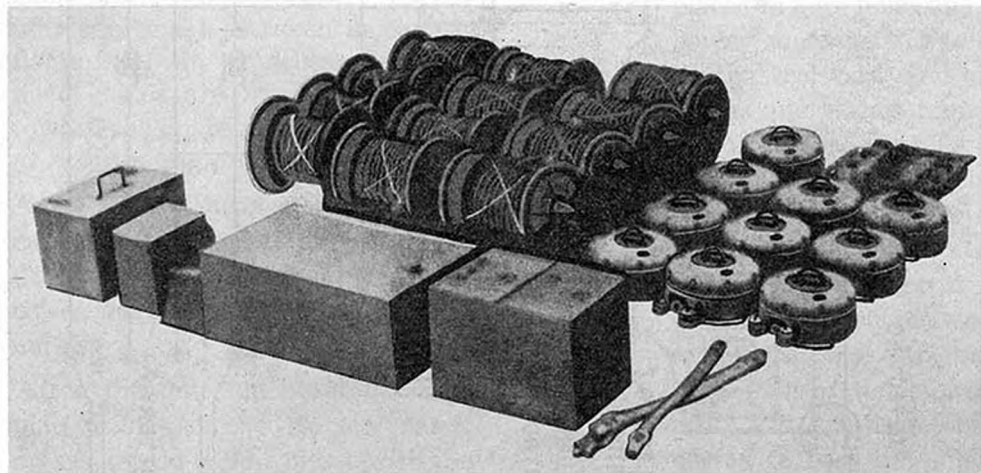
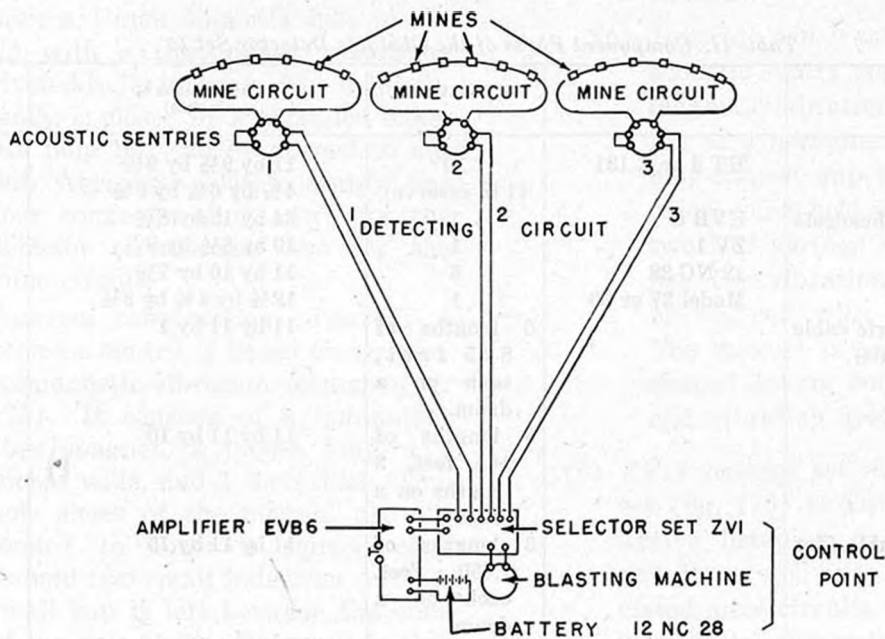


Figure 170. Components of the obstacle detector set 42.

## CONTROL SECTOR

WITH THREE ONE-SENTRY LISTENING CIRCUITS  
AND THREE MINE CIRCUITS



## CONTROL SECTOR

WITH THREE THREE-SENTRY LISTENING CIRCUITS  
AND THREE MINE CIRCUITS

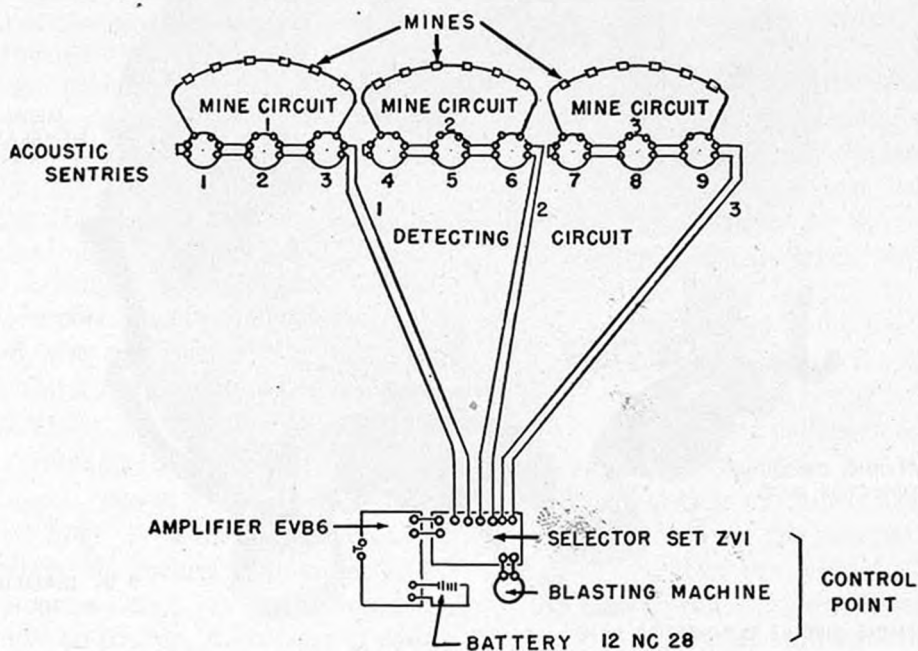


Figure 171. Lay-out of the obstacle detector set 42 as set up for operation.



(1) *HT 6 acoustic sentry.*

(a) *General.* The HT 6 acoustic sentry (fig. 172) is a disk-shaped solid

aluminum casting. It is 9 inches in diameter and 4 inches high. The slightly domed lid, which has a

Table II. Component Parts of the Obstacle Detector Set 42

Equipment	Model	Quantity	Dimensions <sup>a</sup> (inches)	Weight <sup>a</sup> (pounds)
Acoustic sentry	HT 6 or E 131	10 (1 in reserve)	11 by 9½ by 9½ 4¾ by 6¼ by 9½	11 11.5
Amplifier with two headsets	EVB 6	1	24 by 15 by 8½	81
Selector set	ZV 1	1	10 by 8½ by 8	12
Batteries	12 NC 28	6	11 by 10 by 7½	48
Blasting machine	Model 37 or 39	1	12½ by 4¾ by 8½	16.5
Heavy two-core electric cable (for listening circuit).		6 lengths of 825 feet, each on a drum.	11 by 11 by 15	30
		6 lengths of 165 feet, 3 lengths on a drum.		
Single-core electric cable (for mine circuit).		3 lengths of 1,650 feet, each on a drum.	11 by 11 by 15	25.5
Carrying frame for drums		2	16 by 14 by 12	8.5

<sup>a</sup> Includes standard packing for shipping.

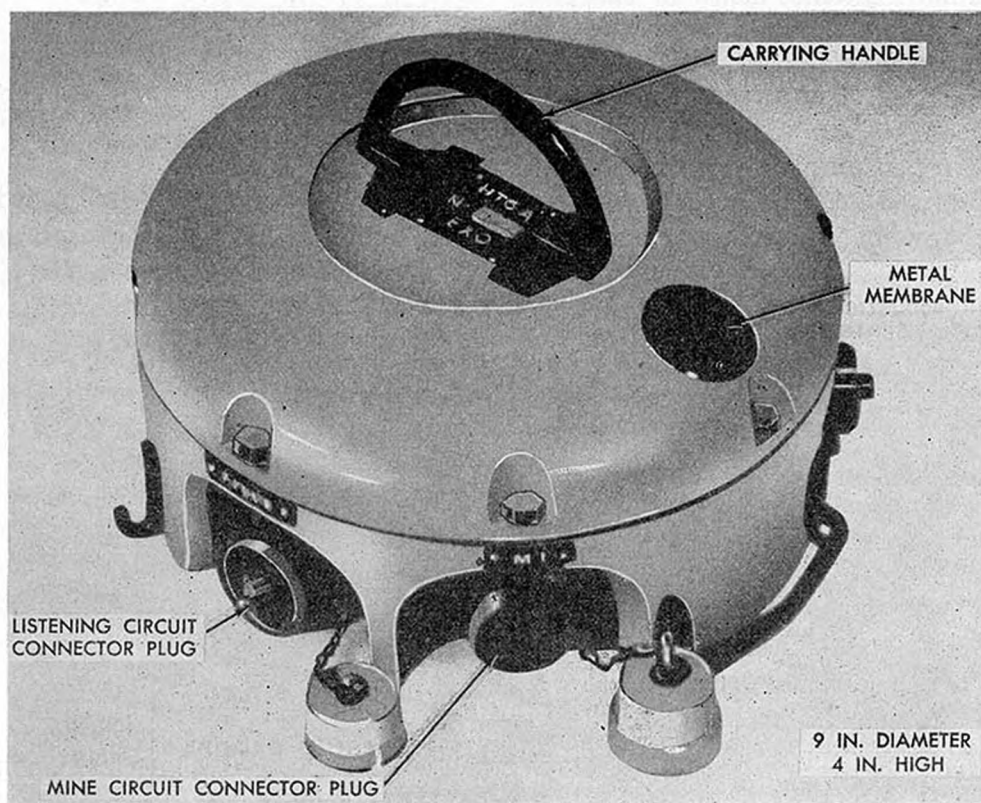


Figure 172. HT 6 acoustic sentry.

countersunk, hinged carrying handle, is held to the casting by eight countersunk bolts. Early models have a 1-inch diameter hole in the lid with a thin metal membrane riveted to its interior. The hole normally is closed by a threaded bakelite plug but can be opened to admit vibrations. Each sentry has four connector plugs, two for the detector circuit and two for the mine circuit.

- (b) *Internal construction.* The HT 6 acoustic sentry is based on an electromagnetic-vibration system (fig. 173). It consists of a laminated-steel magnet, 2 inches long,  $1\frac{1}{2}$  inches wide, and 1 inch thick. The pole shoes of the magnet are extended to form a square cage around two small induction coils. A small gap is left between the ends of the pole shoes. Balanced in this gap is a small vibrator tongue which forms the core of the induction coils. The tongue is mounted on a copper H-shaped bridge. The four setting screws at the end of the tongue allow fine adjustment of its position and the amount of its movement between the poles. One end of the vibrator tongue is rigidly connected, through the vertical limb of an L-shaped carrying member, to the main vibrator. The main vibrator is a brass plate,  $4\frac{3}{4}$  inches long,  $3\frac{1}{2}$  inches wide, and 1 inch thick. It is mounted on a keyhole-shaped cut. The horizontal limb of the L-shaped piece is fixed to the upper pole shoe by a short piece of steel wire screwed into its end, permitting a certain amount of damped vibration.

(2) *E 131 acoustic sentry.*

- (a) *General.* The E 131 acoustic sentry (fig. 174) is a cylindrical metal casting,  $4\frac{3}{4}$  inches in diameter and  $9\frac{1}{2}$  inches high. It has a wooden handle on the top. Two pairs of connecting plugs are located on top of

the unit, one pair for the detector circuit and one pair for the mine circuit.

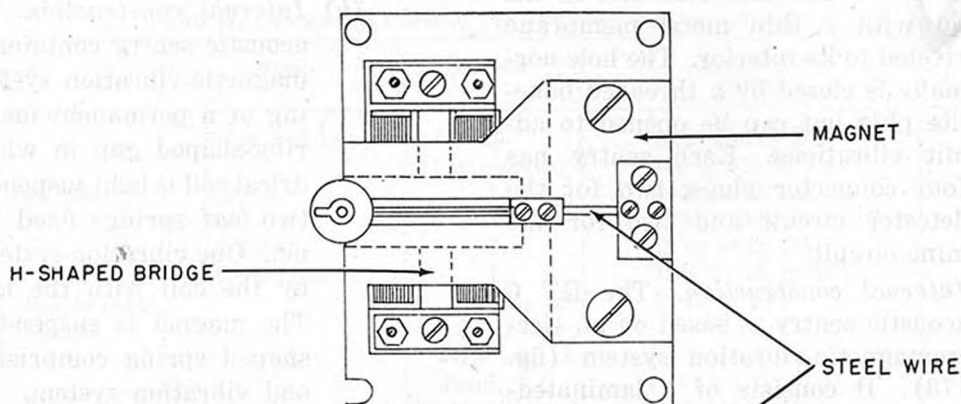
- (b) *Internal construction.* The E 131 acoustic sentry contains an electromagnetic-vibration system, consisting of a permanent magnet with a ring-shaped gap in which a cylindrical coil is held suspended between two leaf springs fixed to the magnet. One vibration system is formed by the coil with the leaf springs. The magnet is suspended on a U-shaped spring comprising the second vibration system.

- (3) *ZV 1 selector set.* The ZV 1 selector set (fig. 175) is designed to allow selective listening to several detector circuits as well as to set off their associated mine circuits. In positions 1 to 3 of the selector switch, individual detector circuits can be engaged, while position 4 connects them in parallel. This arrangement permits listening to all circuits simultaneously.

- (a) *External description.* The front panel of the selector set has two circular switches, the upper switch for selecting the detector circuit and the lower switch for testing and firing the mine circuits. On the right of the panel is a circular cover to allow quick and easy replacement of the electron tube just behind it. The signal light in the center of the panel lights when the mine circuits are being tested. To the right of the control panel are three sockets for plugging in the three detector circuits, and beneath them are two permanent cables, one leading to the EVB 6 amplifier and the other to the blasting machine. These cables are stored in the compartment at the right of the case. A small case containing a spare electron tube and the signal bulb is built into the top of the cable storage compartment.

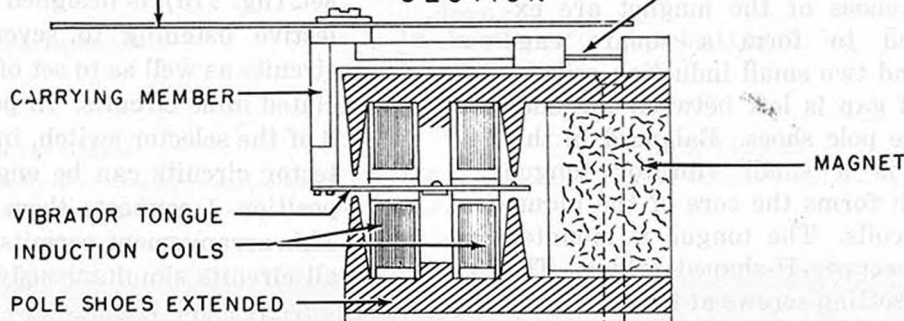
# PLAN

(MAIN VIBRATING PLATE REMOVED)



MAIN VIBRATING PLATE

# SECTION



FIXING SCREWS

H-SHAPED BRIDGE

SETTING SCREWS

VIBRATOR TONGUE

Figure 173. Magnetic system of the HT 6 acoustic sentry.

(b) *Internal construction* (fig. 176). The preamplifying stage consists of an electron tube (RV 12 P 2000) used as a triode. The high-tension and heater current are taken from the EVB 6 amplifier. The cathode

bias is obtained by the resistance ① bridge for alternating current by the condenser ②. The resistance ③ fixes the grid voltage. The mine circuit switch ⑤ is a single-pole switch for connecting the mine test-



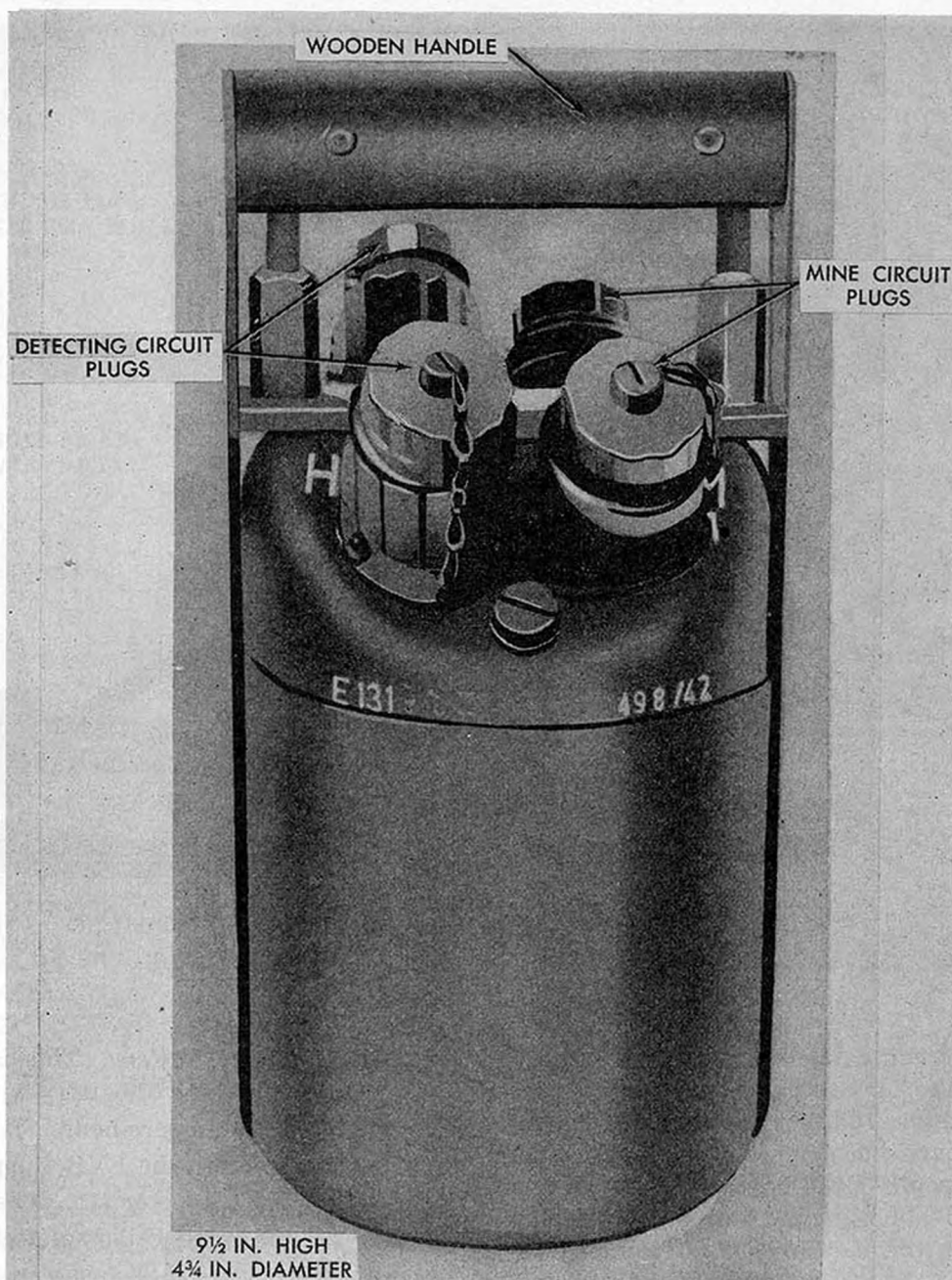


Figure 174. E 131 acoustic sentry.

ing circuit, consisting of an indicator, a signal light ⑥ in parallel with a condenser ⑦, and three protecting resistances ⑧, ⑨, and ⑩. The indicator and the signal light permit the mine circuit to be checked while the protecting resistances limit the current. The condenser ⑦ delays the functioning of the signal light in order to permit the alternative

use of the blasting machine with the different voltage characteristics. The resistances ⑪, ⑫, and ⑬ in the detector circuit selector switch make it impossible for mines to be set off when the switch is in position 4 (listening in on all circuits at once).

(4) Cables and plugs (fig. 177).

(a) Detector-circuit cable. The detector-

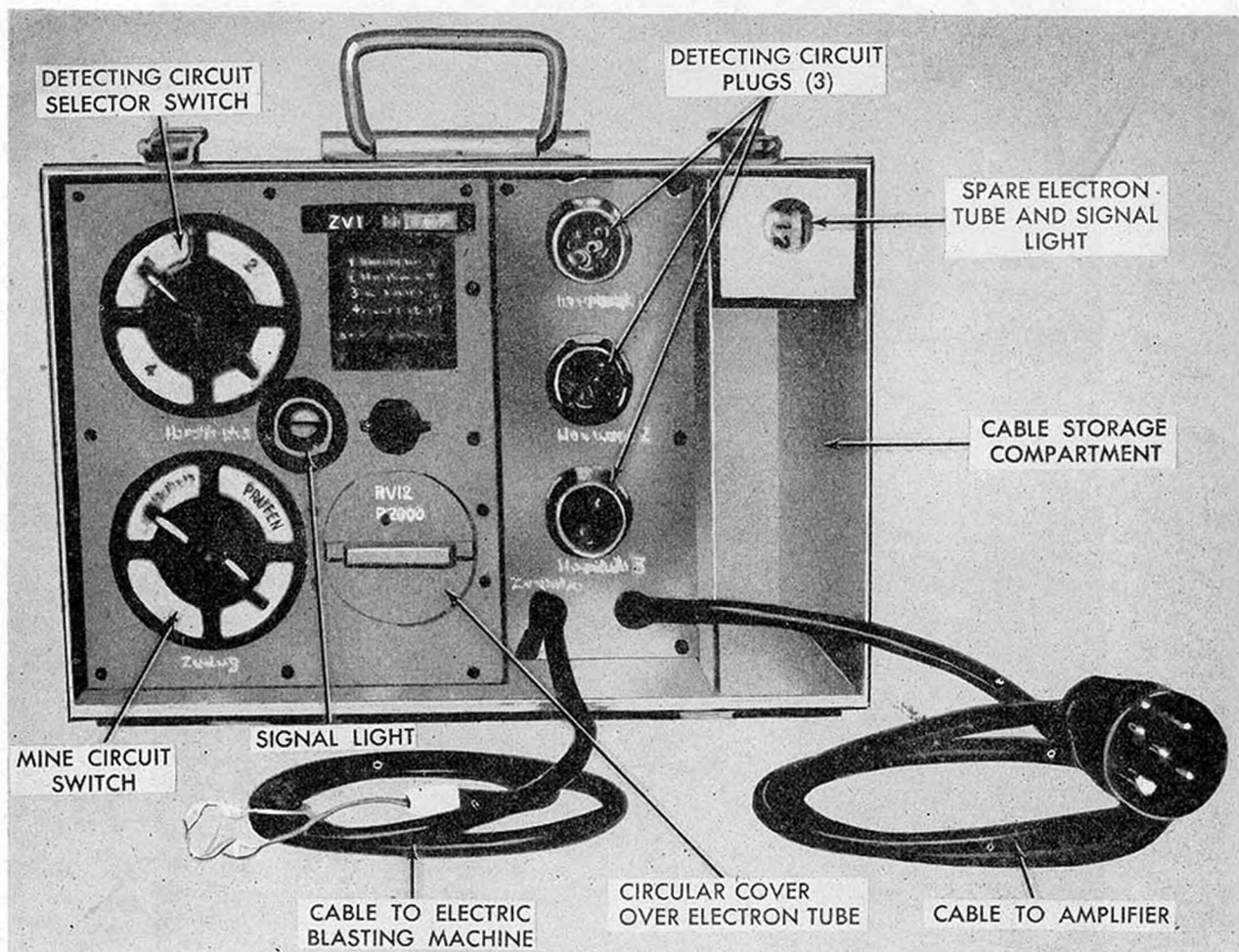


Figure 175. ZV 1 selector set.

circuit cable is a heavy two-core cable. A two-partition drum carries three 165-foot lengths. A single-partition drum carries an 825-foot length in the large compartment and a 20-foot length with a two-pin plug in the narrow compartment. Two-pin plugs and sockets with protective caps are provided for this cable.

- (b) *Mine-circuit cable.* The mine-circuit cable is a single-core cable and is carried in a length of 1,650 feet on one drum. Three drums of cable, 1,650 feet on each, are provided. Single-pin plugs are provided for this cable.

- (5) *EVB 6 amplifier.* This amplifier unit is the same as that used in the mine-gallery detector set 40 (par. 136).

- (6) *12 NC 28 battery.* This is a nickel-cadmium type of battery with a capacity of 28 ampere-hours. It is used to operate both the EVB 6 amplifier and the ZV 1 selector set. It is used also for the mine gallery detector set 40.

- (7) *Blasting machine.* The standard German field blasting machine, either the 37 or the 39 model, is used with this set.

#### e. Installing Equipment.

- (1) *Control post.* The equipment at the control post is set up as shown in figure 178. Setting up the control post can be done by two men. Care should always be taken to set it up on a dry surface.

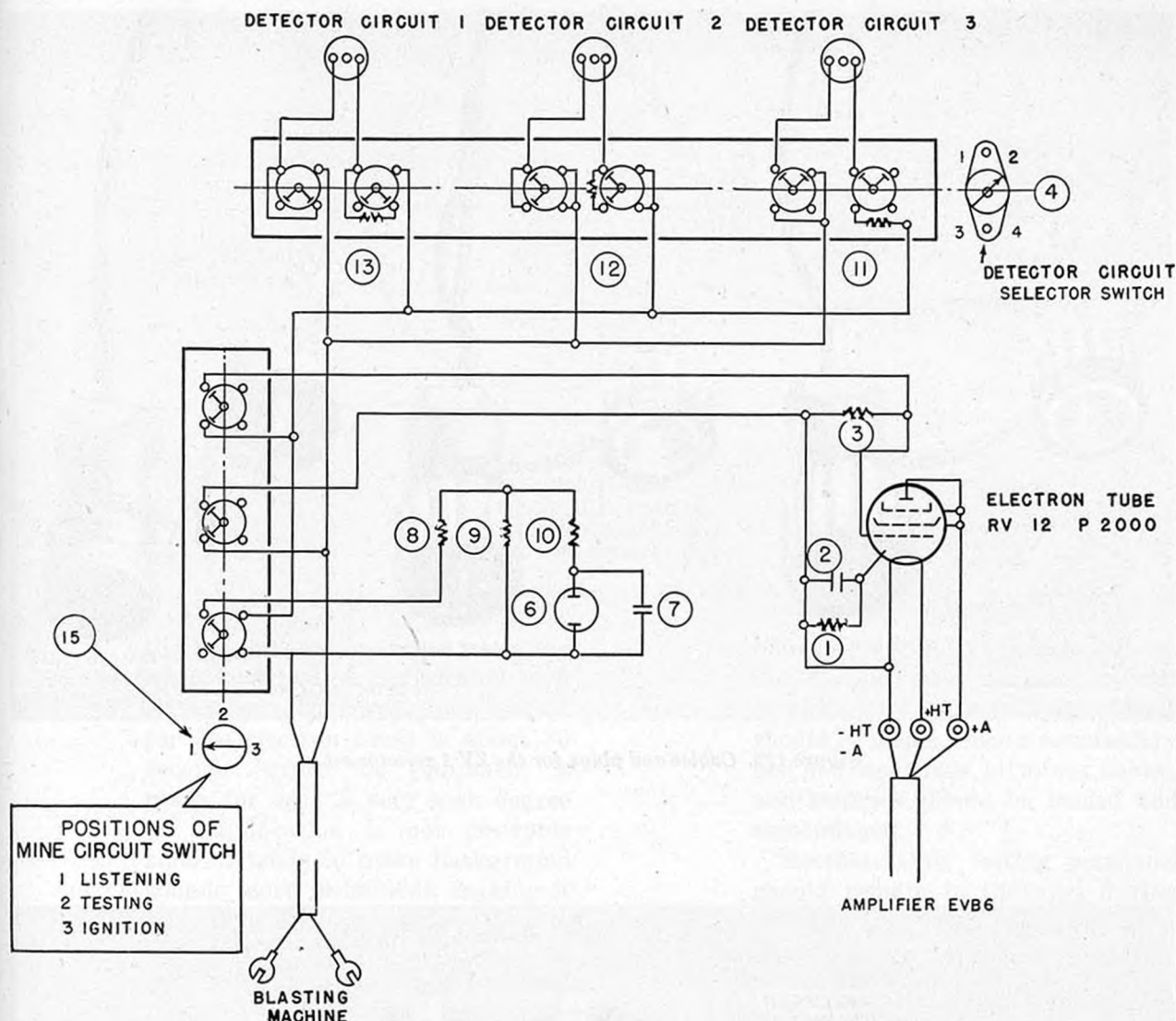


Figure 176. Wiring diagram of the ZV 1 selector set.

(2) Detector circuits (fig. 179).

(a) *Setting up.* Three detector circuits can be connected to the ZV 1 selector set at the control post with the 825-foot lengths of two-core cable. Each detector circuit can contain one, two, or three acoustic sentries. The sentries are interconnected with the 165-foot lengths of two-core cable. Both the HT 6 and the E 131 acoustic sentries have the same wiring diagram (fig. 179). The male two-pin plug H 1 of the first sentry in each circuit is connected to the control post. The female terminal H 2 in the last sentry of each cir-

cuit must always be shorted by screwing on the shipping cap which has two interconnected pins.

(b) *Testing.* When all connections have been made between the control post, the detector circuit, and the acoustic sentries, a test by walking along the whole circuit should be made. The footsteps should be heard all the way. A slight finger touch on the HT 6 sentry should be heard at amplification 0.5 or, on the E 131 sentry, at 1.5. In using the obstacle detector set, the oscillator circuit on the EVB 6 amplifier should be inserted. A slight singing noise in



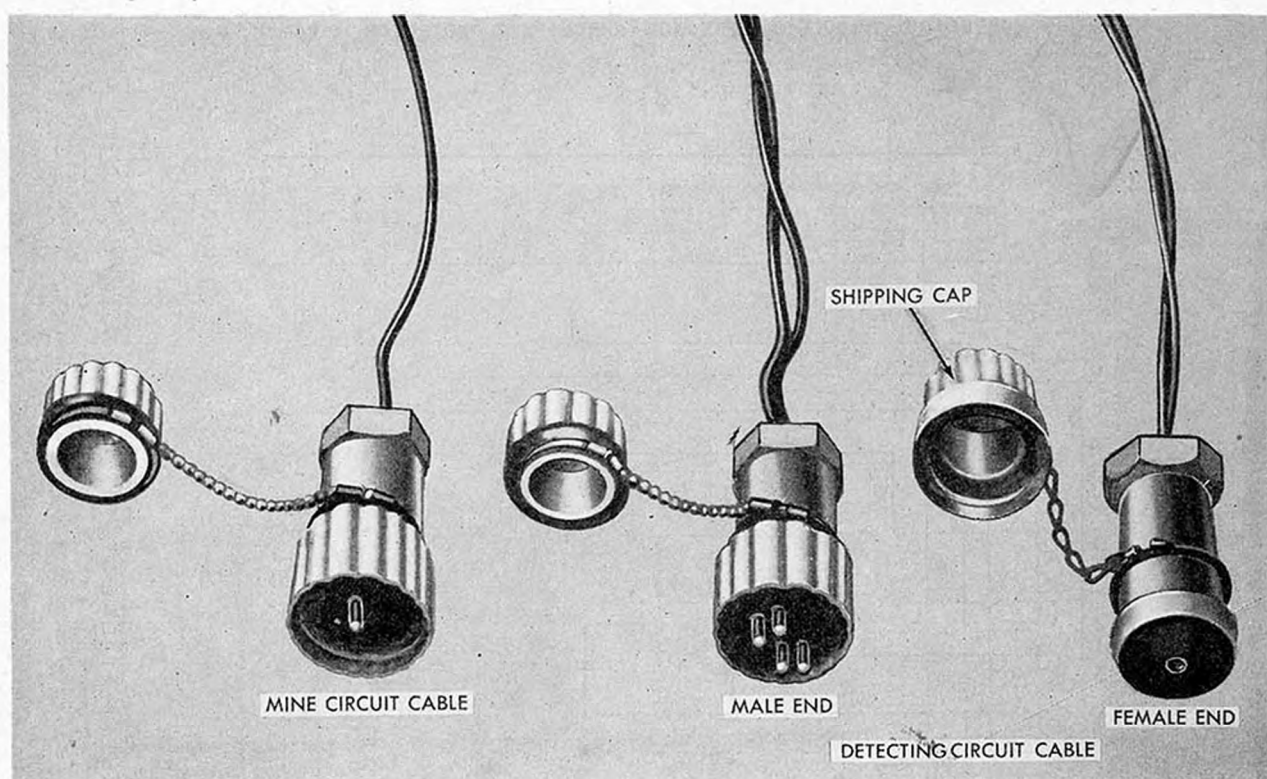


Figure 177. Cables and plugs for the ZV 1 selector set.

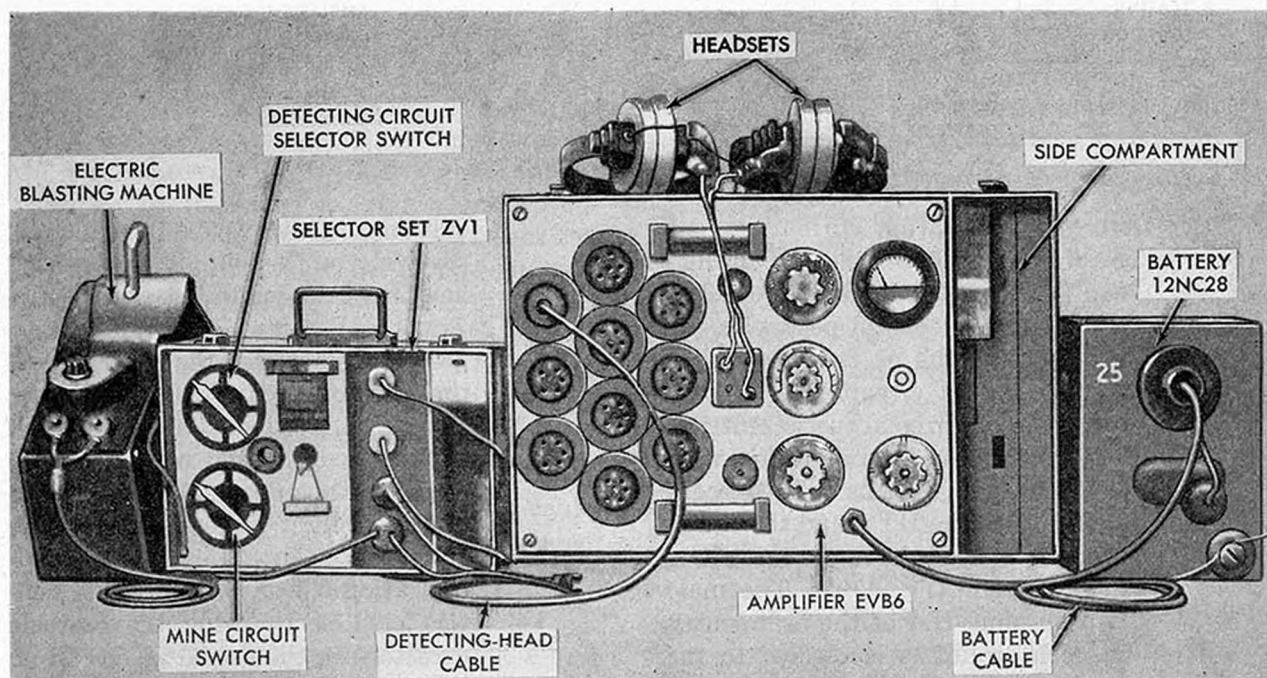


Figure 178. Equipment of the obstacle detector set 42 at the control post.

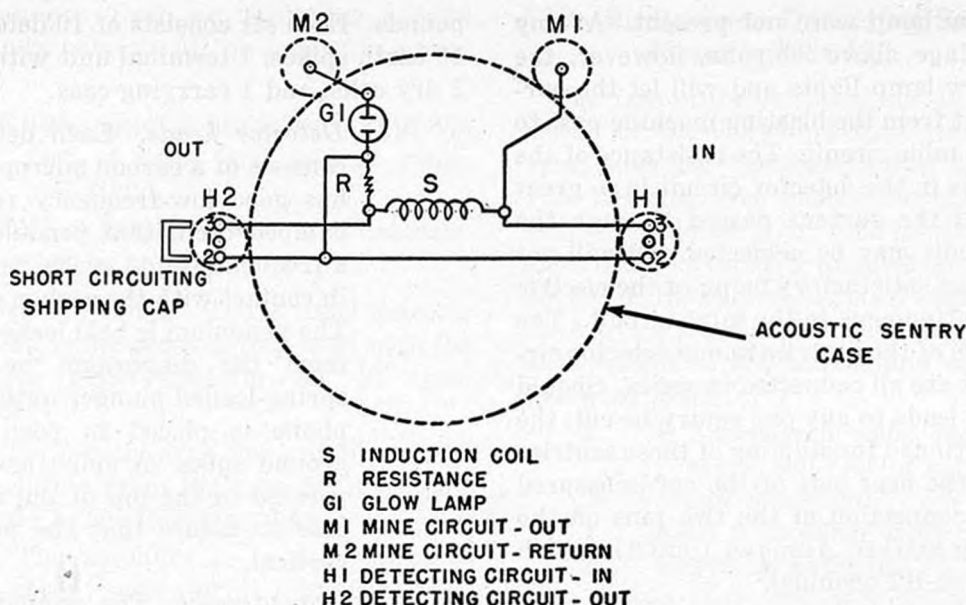


Figure 179. Wiring diagram for the acoustic sentries.

the headset can be heard when the set is switched on and also on each excitation. The heating-up period for the electron tubes is about 30 seconds before the equipment is ready for use. A very high degree of amplification is not desirable since it tends to make background sounds more prominent, making it more difficult to recognize approaching sounds. By inserting the low-pass filter it is possible to cut out frequencies below 200 cycles per second.

(3) *Mine circuits* (fig. 171).

(a) *Setting up.* Firing of the mine circuit is always done electrically. The electric leads from the electric blasting caps are connected directly to the firing wire. The mine circuit starts from the first sentry in a detector circuit at the terminal marked M1 and ends at terminal M2 of the last sentry in the same circuit.

(b) *Testing.* When all the connections have been made, and before the mines or charges and the cables have been buried, the mine circuits are tested one by one. The selector switch is turned to *Prufen* (testing). If the signal light and the

indicator sign fail to react on releasing the blasting machine, normal checking by a continuity tester should be made. Once a satisfactory test has been made, all mines, cables, and sentries should be buried and camouflaged.

**Caution:** Only testing personnel should remain in the area during testing.

f. *Functioning.*

- (1) *Acoustic sentries.* Both the HT 6 and the E 131 acoustic sentries receive ground vibrations through a damped harmonic system. The most receptive frequency for both sentries corresponds to the wave lengths usually experienced in soil and rock; thus a high degree of sensitivity is achieved. The damping of the system allows the reception of vibrations as low as a frequency of 50 cycles per second. Both types of acoustic sentries contain a glow lamp used as a high-voltage shunt to separate the listening circuit from the mine circuits. Since the resistance in the mine circuit is much smaller than that in the detector circuit, the voltage induced in the coils would be shorted through the mine circuit and would never reach the amplifier if the

glow lamp were not present. At any voltage above 90 volts, however, the glow lamp lights and will let the current from the blasting machine pass to the mine circuit. The resistance of the coils in the detector circuit is so great that the current passed through the circuit may be neglected and will not effect satisfactory firing of the electric blasting caps in the mine circuit. The coils of the sentries in one detector circuit are all connected in series. Should the leads to any one sentry be cut, the continued functioning of those sentries on the near side of the cut is assured by connection of the two pins on the plug marked *Ausgang* (outlet), which is the H2 terminal.

(a) *HT 6 acoustic sentry.* When the HT 6 sentry is subjected to any vibration, the vibration is taken up by the vibrator system. The vibrator tongue moving back and forth in the gap between the pole shoes causes changes of flux in the magnetic field, thus inducing a voltage in the coils. This variable voltage is brought to the main amplifier through the selector set.

(b) *E 131 acoustic sentry.* Vibration causes the coil to move back and forth within the groove, inducing a voltage in it corresponding in intensity to the vibration rate. The voltage passes through the selector set to the main amplifier and can be heard through the headset.

(2) *Mine circuit.* Each mine circuit is fired individually. It is not possible to fire them all at once. The blasting machine must be rewound and released, after adjusting the selector switch, for the firing of each mine circuit.

pounds. Each set consists of 10 detector heads, 10 earth spikes, 1 terminal unit with 1 headset, 2 dry cells, and 1 carrying case.

(1) *Detector heads.* Each detector head consists of a carbon microphone which has good low-frequency response. A damped oscillation pendulum, having a frequency of 11 cycles per second, is in contact with the carbon diaphragm. The pendulum is held locked and away from the diaphragm by a simple spring-loaded plunger until the microphone is placed in position on its ground spike. A spirit level is incorporated in the top of the microphone case to assure that the pendulum is vertical.

(2) *Ground spike.* The ground spike is a light-metal, corkscrew type spike, 11 $\frac{3}{4}$  inches long. A bar is provided for screwing the spike into the earth. A locking universal joint fits over the end to receive the microphone.

(3) *Terminal unit.* The terminal unit consists of a 10-pair terminal strip with a 10-position switch by means of which the headset may be connected to any desired detector head. One terminal of each of the switches of the 10 pairs of detector-head cables is a common terminal. The terminal unit is mounted in the lid of the standard German field telephone case, while the dry cells and the headset are carried in the lower half of the case. In some cases a plug and jack arrangement is provided for connecting the microphones in parallel groups of three for preliminary separation of sound location before reverting to use of the 10-position switch.

b. *Employment.* This set may be used in conjunction with the multiple ignition set 44 (par. 149) for detonating controlled mine fields.

### 137. Portable Mine Detector Set (Minierhorchgerät)

a. *Description.* The portable mine-detector set is intended to provide a simple means of detecting tunneling activity. It weighs only 35

### 138. Clockwork-Fuze Detecting Set 41 (Zünderhorchgerät 41)

a. *General.* This equipment is used for the detection of clockwork-fuze mechanisms.



b. *Description.* Each set, weighing a total of 966 pounds, consists of the following equipment:

- 5 E 105c detector heads, each with 660 feet of cable and folding cable-reel stand.
- 1 EVB 9 amplifier with two headsets.
- 1 12 NC 28 battery.

(1) *Detector heads.* The E 105c detector head is the same as that used with the mine gallery-detector set 40 (par. 135).

(2) *EVB 9 amplifier.* The amplifier EVB 9 differs from the type EVB 6 (par. 135) in the following details:

(a) The amplifier is in four stages—three screen-grid amplifiers followed by an output triode. All electron tubes are RV 12P 2000. Power is supplied, as in the EVB 6, from a 12-volt battery through a built-in vibrator pack, which has more than normal suppression to eliminate low-frequency interference. A selector switch connects to any desired detector head, and a coupling switch links all heads together in position ALL. In this case a resistance in the grid circuit of the second stage is short-circuited. For using the selector switch for single detector heads, the coupling switch must be in the position SINGLE.

(b) Frequencies under 300 cycles are blocked by a high-pass filter between the first and the second amplification stages. The gain control is in the grid circuit of the second stage.

(c) Operation begins with all the detector heads connected. When clockwork vibrations are detected, the source of the vibrations is located by using the SINGLE and selector switches to determine the detector head which requires the least gain.

(3) *12 NC 28 battery.* This piece of equipment is the same as that described in paragraph 135.

## 139. Radio-Fuze Detecting Set 42 (Zündersuchgerät 42)

The radio-fuze detecting set 42 can be used instead of the clockwork-fuze detecting set 41 (par. 138) for the detection of buried mines. This detecting set makes use of the varying magnetic field set up by such mines. This equipment is used primarily to unearth charges using Soviet F.10 radio-controlled fuzes (TM 5-223A). Each radio-fuze detecting set 42 has a total weight of 926 pounds and consists of the following items:

- 5 E 132 search coils, each with supports, 600 feet of cable on a reel, and reel stand.
- 1 EVB 9 amplifier with two headsets.
- 2 12 NC 28 batteries.

a. *Search Coil.* The E 132 search coil consists of a circular disk about 21 inches in diameter with three sockets on each side for the supporting legs. The search coil itself (fig. 180) is formed of several thousand turns of fine wire, forming a tuned circuit for about 350 cycles per second, and a trimming condenser. The circuit is connected to the grid of an RV 12P 2000 electron tube preamplifier stage mounted in a metal case in the lower part of the circular disk. The search coil is connected to the EVB 9 amplifier by a four-core shielded cable. The search

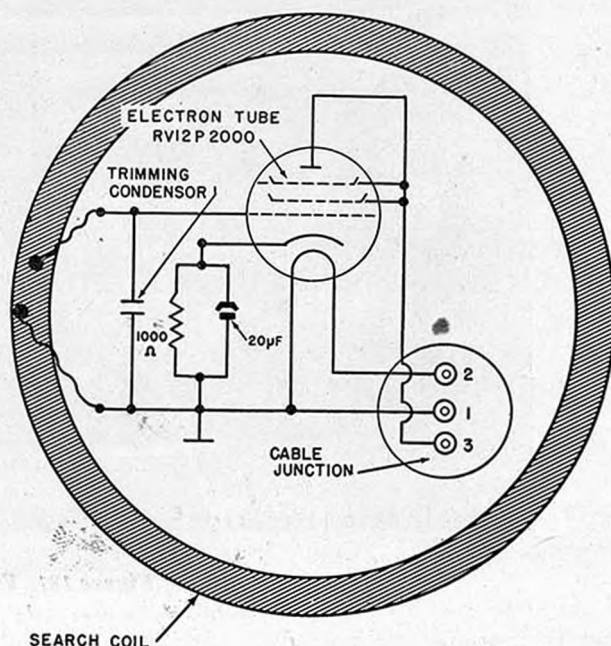
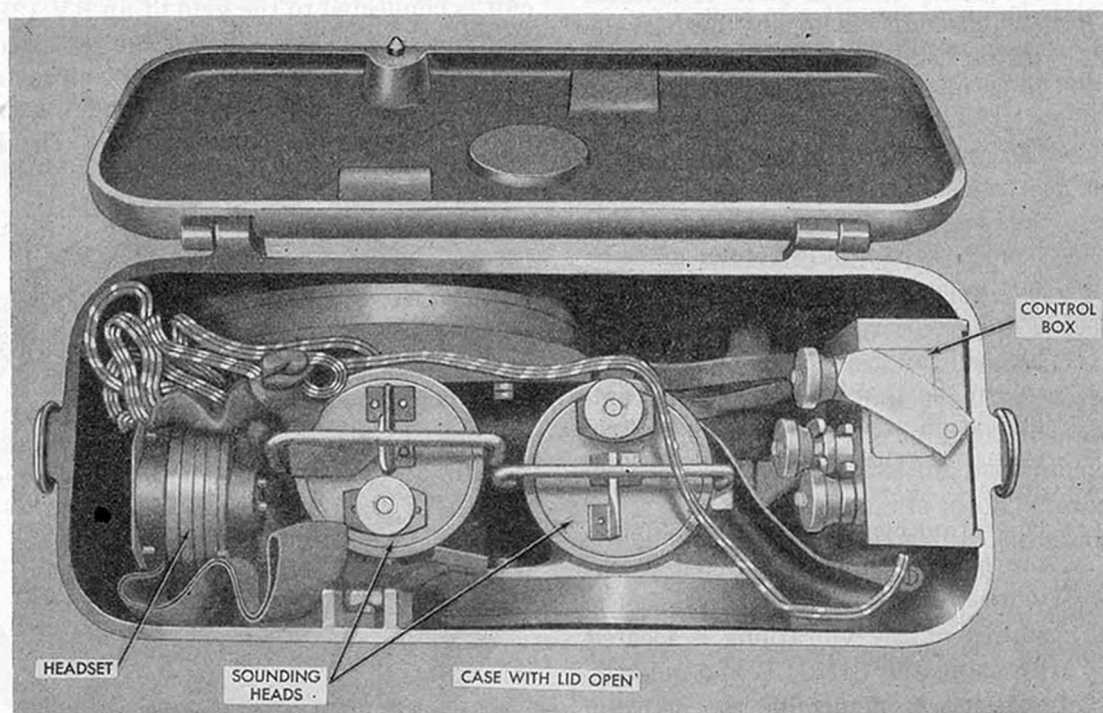
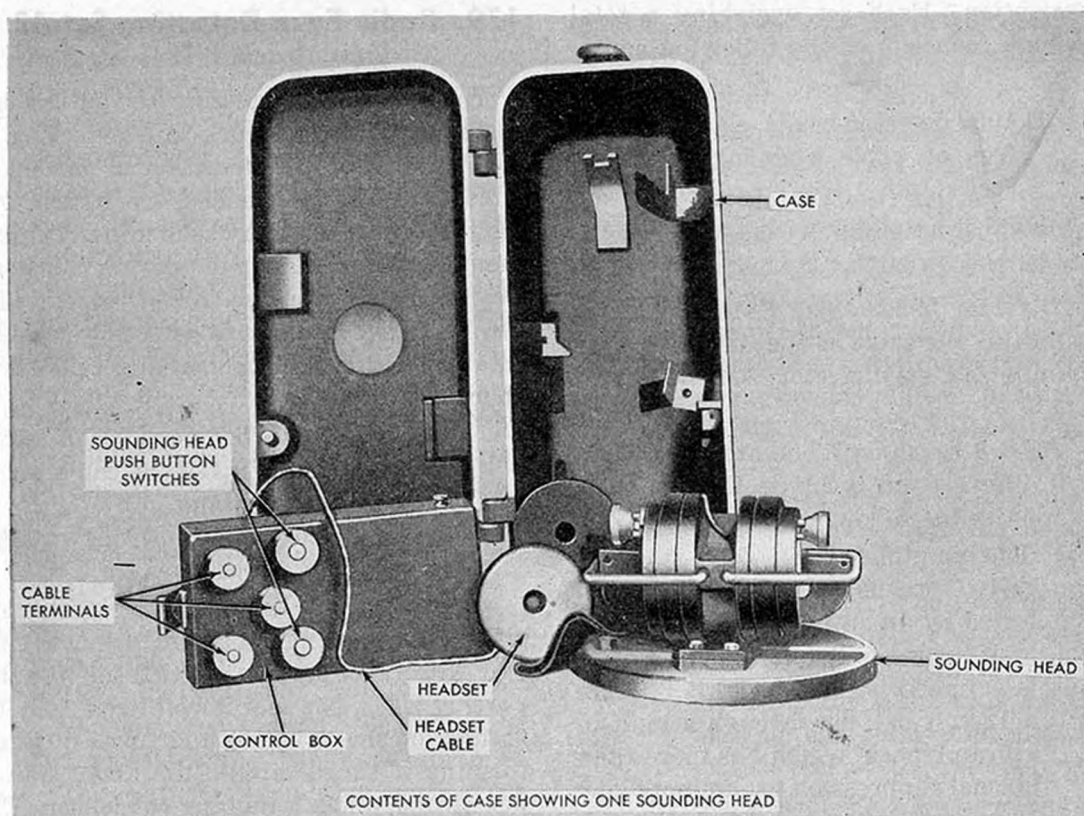


Figure 180. Circuit diagram of the E 132 search coil.



**Figure 181. Vibration detector.**

coil is most effective when set at right angles to the magnetic lines of force coming from a buried mine. Supporting legs are provided to hold the search coil upright.

b. *EVB 9 Amplifier.* The EVB 9 amplifier is the same as that described in paragraph 138. A detecting control post, such as is used with the mine-gallery detector set 40 (par. 135), can be located at a distance of up to 440 feet from suspected mines.

## 140. Vibration Detector

a. *General.* The vibration detector (fig. 181) can be used to detect underground tunneling operations, to operate as an acoustic mine obstacle, and to detect radio detonated, remote controlled mines and mines set with clockwork delay fuzes.

b. *Description.* The complete apparatus (fig. 181) is housed in a black cast-metal case of extremely strong and moisture-resistant construction. It consists of two sounding heads, a control box, a 40-ohm headset, and a 4½-volt dry cell battery.

(1) *Sounding head.* Each sounding head (fig. 182) has a horizontal copper plate diaphragm, 5½ inches in diameter. Its vibrations are transmitted

through a vertical air column to a double-button microphone. Each button has resistance of about 200 ohms. The sounding head weighs about 5 pounds and is 3¾ inches high and 5¾ inches in diameter at the widest part of the base. Two terminals are provided for connecting by cable to the control box.

(2) *Control box.* The wooden control box (fig. 183) contains the headset, which is permanently attached to the box, and the battery. The total weight, including the headset and the battery, is about 1 pound. The box is 6 inches long, 3 inches wide, and 1½ inches high. It is equipped with three cable terminals, the center one being a common return for both sounding heads. Two white push buttons enable the sounding heads to be used independently of each other.

c. *Wiring.* The two sounding heads are connected in parallel to the control box where they are joined in series circuit with the battery and the headset through the white push-button switches (fig. 184).

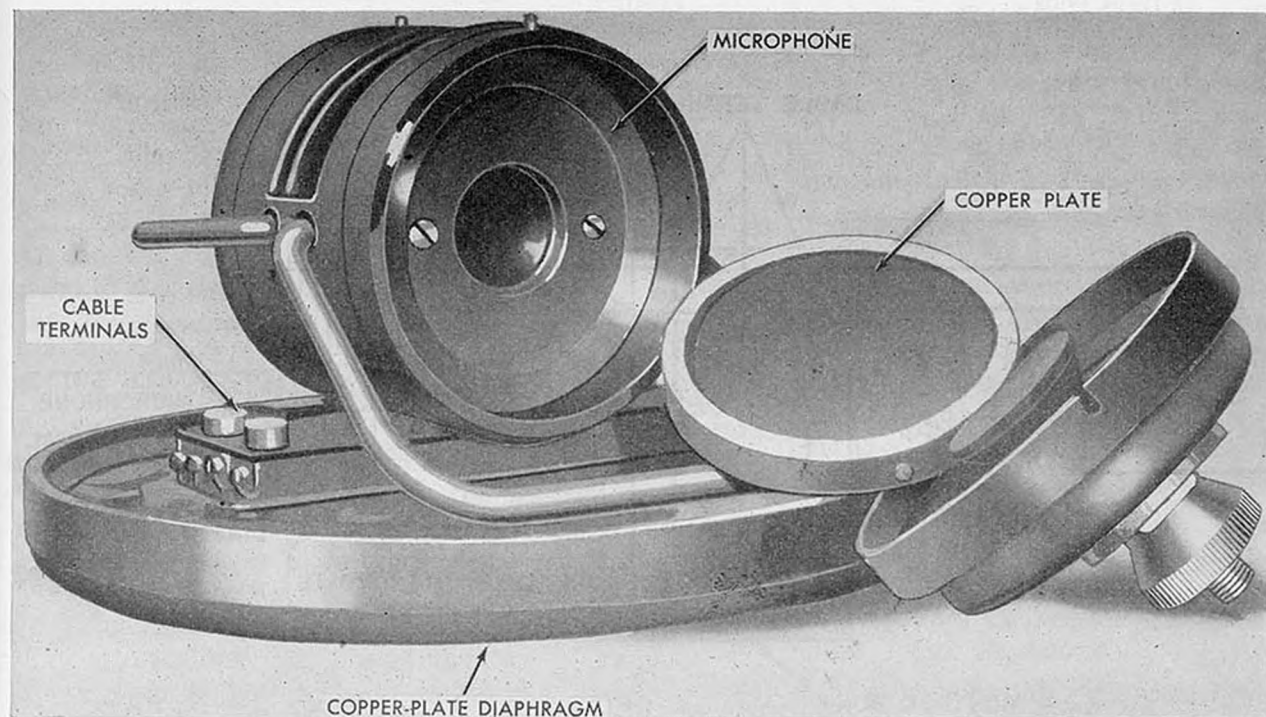


Figure 182. Sounding head for the vibration detector.



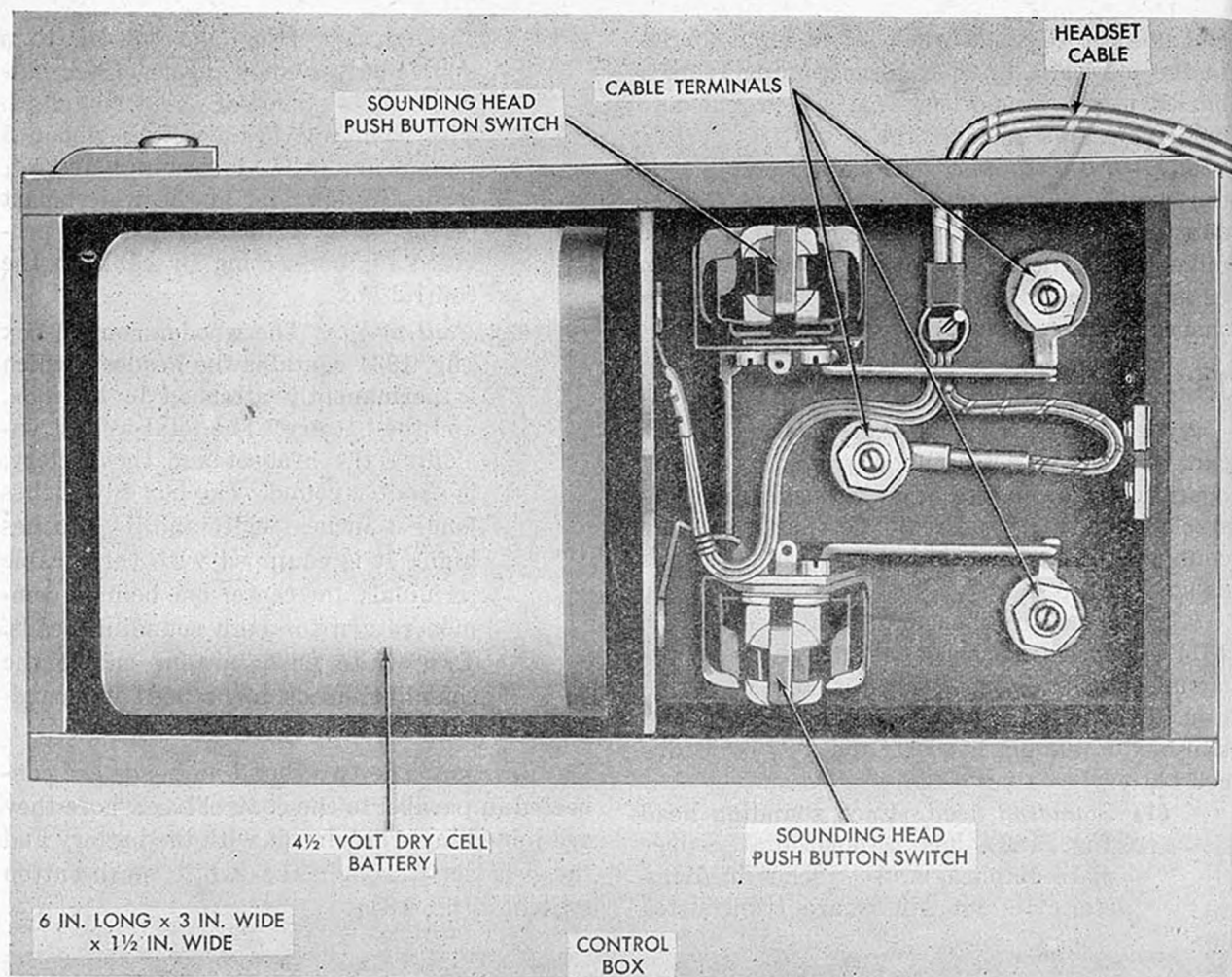


Figure 183. Interior of the control box.

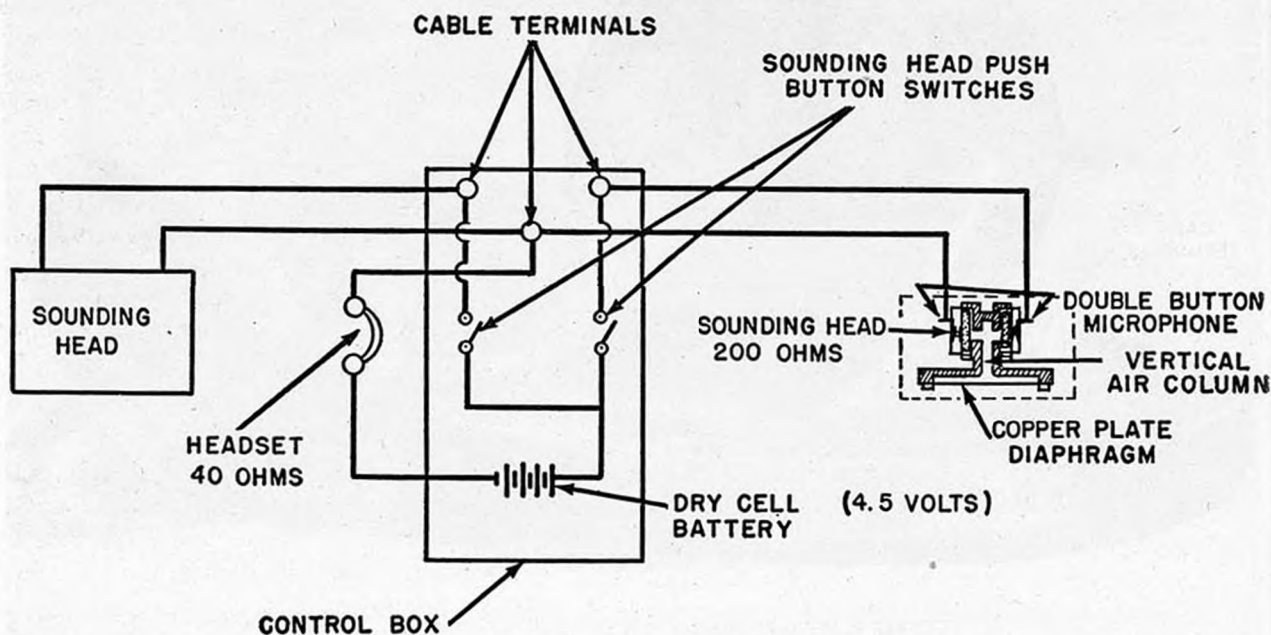


Figure 184. Wiring diagram of a vibration detector.

## CHAPTER 10

### MISCELLANEOUS MINE WARFARE EQUIPMENT

#### Section I. MINE LAYING, MARKING, AND RECORDING EQUIPMENT

##### 141. General

The only special mine-laying equipment used by the Germans was a mine spacing wire (Minenmessdraht) described in paragraph 142. German equipment for marking mines and mine fields is described in paragraph 143. German mine field recording equipment is similar to that of the U. S. Army.

##### 142. Mine Spacing Wire (Minenmessdraht)

*a. Description.* The mine spacing wire (fig. 185) is 85 feet  $3\frac{5}{8}$  inches long, and has a number of rings and wooden crosses, bars, and blocks fixed to it. Four rings are located at various distances from the right end of the mine spacing wire. The first wooden cross, 6 feet  $6\frac{3}{4}$  inches from the right end, is the zero point for all the following marking devices:

- Wooden crosses at 4, 8, 12, 16, 20 meters
- Wooden bars at 2, 6, 10, 14, 18, 22 meters
- Wooden blocks at 1, 3, 5, 7, 9, 11, 13, 15, 17, 21, 23 meters

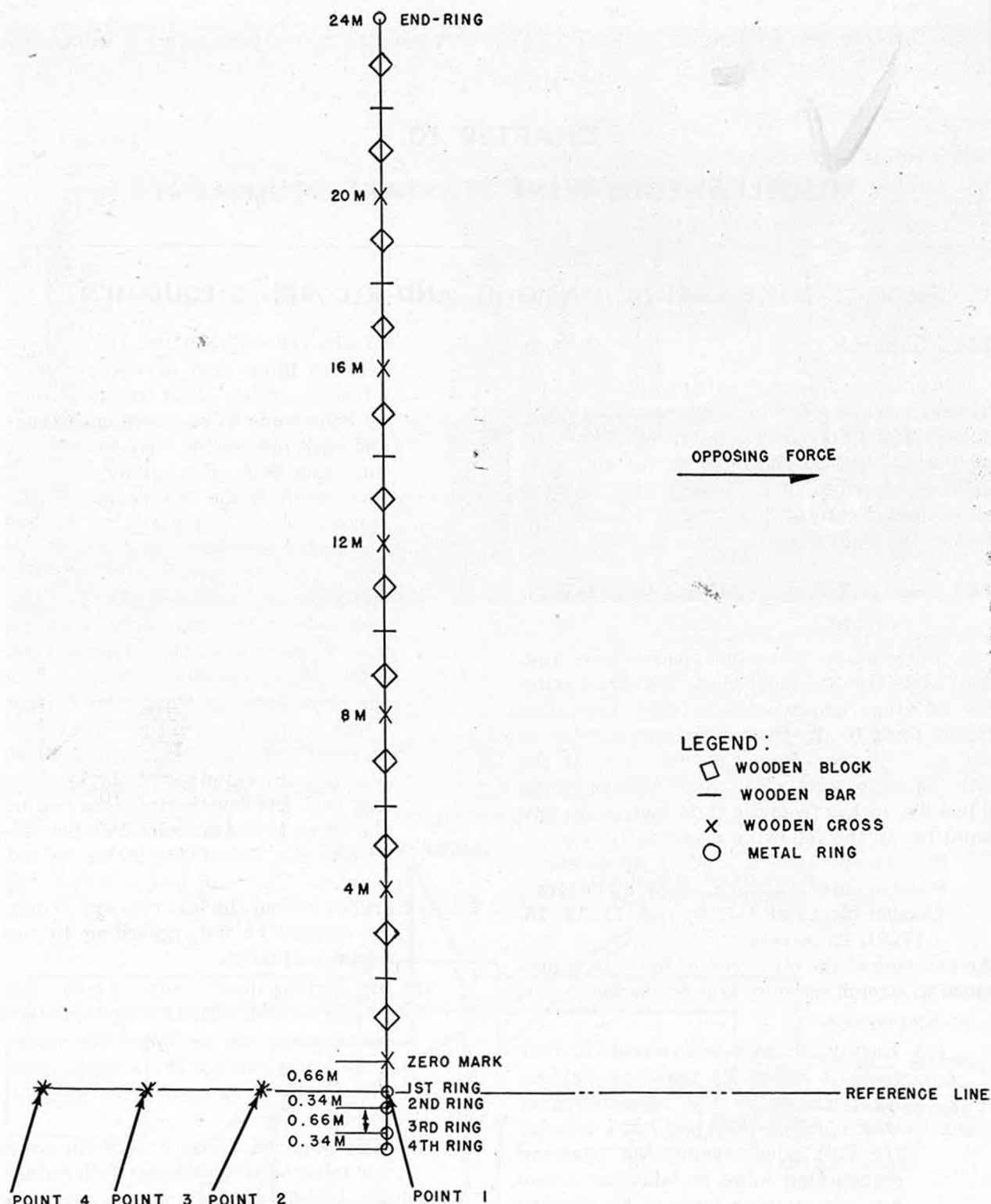
An end-ring at the other end of the wire is provided to stretch the wire taut for laying.

*b. Employment.*

- (1) Each basic mine belt consists of four rows of mines, 81 feet long, laid at right angles to the reference line, which marks the right-hand edge of the belt when facing the opposing force. One mine is laid just above any one or more types of the wooden marking devices along the mine spacing wire. In order to stagger the rows of mines, any one of the four rings can be put on the reference line. For example, in laying Tellermine 42 and

43 with camouflage cover, the distance between mines and between rows is 6 feet  $6\frac{3}{4}$  inches. This spacing is done by laying one mine above each cross and each bar on the wire throughout the mine belt. For laying the first row, which is the row nearest to the opposing force, the first ring (4 feet  $4\frac{1}{2}$  inches from the right end of the wire) is laid on point 1. For the second row, the second ring (3 feet  $3\frac{1}{2}$  inches from the end of the wire) is laid on point 2 on the reference line, 6 feet  $6\frac{3}{4}$  inches behind point 1. For the third row, the third ring (1 foot 1 inch from the end of the wire) is laid on point 3 on the reference line, 6 feet  $6\frac{3}{4}$  inches behind point 2. For the last row, the fourth ring (the end of the wire) is laid on point 4 on the reference line, 6 feet  $6\frac{3}{4}$  inches behind point 3. The base line is 6 feet  $6\frac{3}{4}$  inches behind the last row and it may be marked or not, according to the tactical situation.

- (2) By varying the sequence of rings and of marks used, a great variety of staggered rows can be laid. The above example is merely the simplest possible method; it was not always followed.
- (3) The required distance between rows for mine belts containing Tellermines 35, uncovered Tellermines, and rail mines is 13 feet  $1\frac{1}{2}$  inch; for S-mines 35, 6 feet  $6\frac{3}{4}$  inches; and for Schü'-mines, 1 foot  $7\frac{3}{4}$  inches.
- (4) Mine belts containing different types of mines may be laid with the spacing



NOTE: 1 METER = 1.094 YARDS = 3.281 FEET

Figure 185. Mine spacing wire.



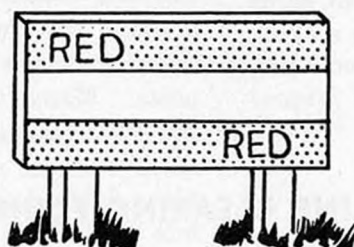
wire; for example, a Tellermine at each cross and bar and an S-mine at each block, and the reverse for alternate rows.

### 143. Mine Field Markers

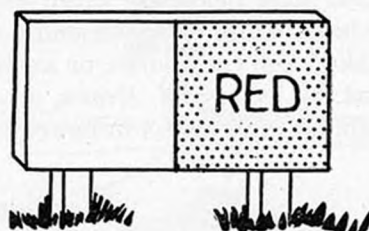
a. *Corner Posts.* Posts marking the corners



CORNERPOST  
MARKER



MINE FIELD EDGE  
MARKER



MINE FIELD GAP  
MARKER

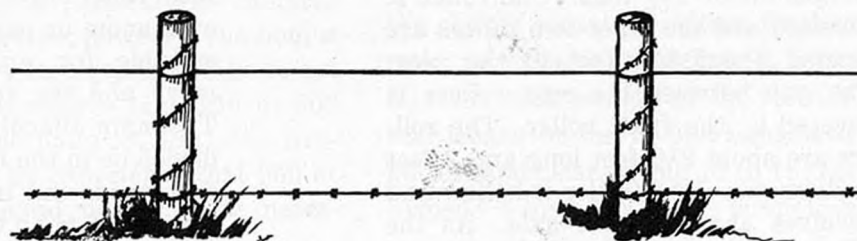
RED AND WHITE MINE FIELD MARKERS



BLACK AND WHITE MINE FIELD MARKERS

SMOOTH WIRE

BARBED WIRE



WARNING FENCE

Figure 186. Typical mine field marking signs.

of a mine field are faced on the friendly side with the flat surface painted red and the letters *Mi* (for *Minen*) painted in black on the red surface (fig. 186).

b. *Mine Field Edges and Gaps.* The rear and side boundaries of mine fields are marked by a

rectangular sign painted on the friendly side with two red and one white horizontal strips as shown in figure 186. Gaps in mine fields are marked with rectangular signs with one half of the friendly side painted white and the other half red (fig. 186). The white half of the sign is toward the gap and the red toward the mine field or danger side. If red paint is not available, mine fields are often marked with signs painted white on the friendly side with a skull, a skull and crossbones, or an outstretched hand, and the letters *Mi*, *Minen*, or *Achtung! Minen!* painted in black, as in figure 186.

c. *Warning signs.* Mine warning signs with vertical lettering indicate live mine fields; those with slanted lettering are used to indicate dummy mine fields.

d. *Warning Fences.* In general, German mine fields are fenced in with warning fences on the friendly side, as shown in figure 186. These warning fences usually consist of two strands of wire, the lower strand barbed wire and the upper smooth wire, attached to regularly spaced posts. Many German mine fields, however, were not marked at all.

## Section II. MINE CLEARING EQUIPMENT

### 144. General

Most German mine clearing equipment is similar to that constructed by the Soviets (TM 5-223A) and falls into two general groups—mechanical devices and explosive devices. Mechanical devices for mine clearing consist primarily of drags and grapnels for clearing mines laid with trip wires, and tank-mounted rollers (par. 145) for detonating mines which have pressure fuzes. Most of the drags and grapnels are field-expedient devices.

### 145. Mine Roller 3001 (*Minenräumergerät 3001*)

#### a. Description.

- (1) The mine roller 3001 consists of roller assemblies mounted on the forward ends of two steel arms. The arms are about 10 feet long and are independently mounted by a torsion-spring connection to the front of a tank, so they will project forward. Each roller assembly has three identical rollers and weighs about  $1\frac{1}{2}$  tons. One roller is forward and the other two rollers are located about  $3\frac{1}{2}$  feet to the rear. The gap between the rear rollers is covered by the front roller. The rollers are about  $2\frac{1}{2}$  feet long and 2 feet in diameter. Each roller is hollow and revolves about a fixed axle. As the roller turns, a planetary gear inside the roller revolves at the midpoint of the axle shaft which drives an unbal-

anced weight. The gear revolves at approximately eight times the speed of the roller, or at such a speed as to give the weights at least two downward pulsations of the roller for approximately every 12 inches of its travel over the surface of the ground. There are then at least two pulsations per mine (assuming mines are 12 inches in diameter). The impact effect of these pulsations may be of from 1 to 3 tons. The torsion springs keep all rollers in contact with the uneven surface of the ground with about 250 pounds of pressure on each roller.

- (2) When a mine is exploded, an individual roller is destroyed. It can be easily removed and a spare roller attached in 15 to 20 minutes. Two to four spare rollers are carried on the tank.
- (3) Several different types of roller surfaces are used, including smooth, toothed, lugged, corrugated, and wavy surfaces. No one type of roller surface functions entirely satisfactorily over snow or sand. The rollers most suitable for universal use are the wavy and the smooth surface types. The main difficulties in the use of this device lie in the replacement of rollers destroyed, and in that only two narrow paths, not a wide path, are cleared through a mine field. The power required to operate the mine roller 3001 is, however, appreciably less than that

required for most other mine clearing devices of the tank-mounted type.

*b. Effectiveness.* A tank can push the two roller assemblies over the ground at 3 to 6 miles per hour. The rollers will explode mines equipped with pressure fuzes and buried as deep as 6 inches below the surface. Each roller assembly clears a path approximately 6 feet wide.

## 146. Explosive Devices

*a. Shells and Bombs.* The Germans used shelling and bombing to clear lanes in mine fields which were fairly well-located and which could not be cleared by other methods. Shelling and bombing were not used to clear entire mine fields.

(1) *Shelling.* In clearing lanes with artillery fire, the Germans used light field howitzers and 21-cm (210-mm) mortars (short-barrelled howitzer, not like the U. S. infantry mortar) with instantaneous percussion-fuzed shells, and heavy field howitzers with short-delay percussion-fuzed shells. The fire was concentrated. To clear a lane about 75 feet wide and 300 yards deep, the Germans expended the following approximate number of rounds:

- (a) 120 rounds from the 21-cm mortar with instantaneous percussion fuzes.
- (b) 400 rounds from the heavy field howitzer with delay percussion fuzes.
- (c) 600 rounds from the light field howitzer with instantaneous percussion fuzes.

(2) *Bombing.* The Germans found bombing in rows with 110-pound (50-kg) bombs to be a particularly effective clearing practice; however, the bombs made craters too deep for tanks to get through. To clear a lane 150 to 300 feet wide and 650 feet deep, the Germans found by experience that 960 of these 110-pound bombs were necessary.

*b. Detonating-Cord Net (Knallnetz).* The Germans cleared lanes through mine fields by

using detonating-cord nets. Each net is 30 feet long and 8 feet wide with a 6-inch mesh (fig. 187). It weighs about 20 pounds and has a diameter of 6 inches, when rolled. The net is raised 2 to 3 feet above the ground on pegs or stakes. It is laid by hand.

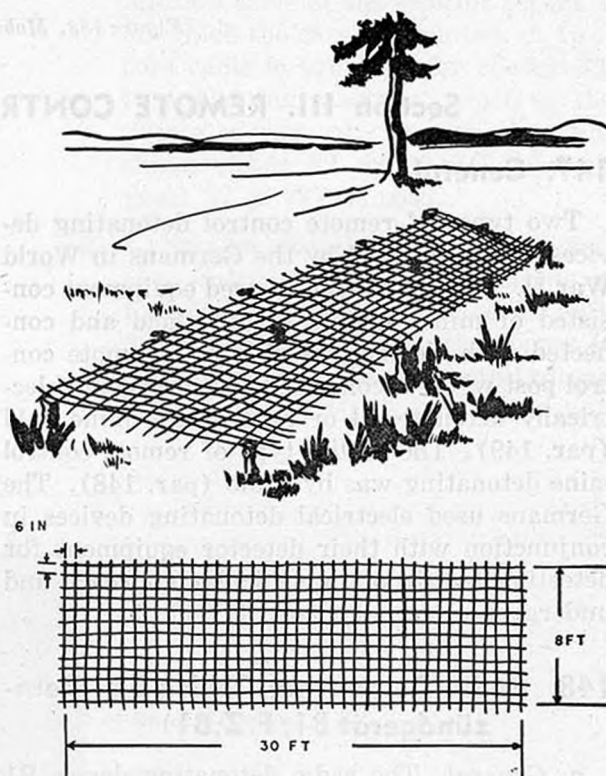


Figure 187. Detonating-cord net.

*c. Mobile Bangalore Torpedo (Ladungsschieber).* The mobile bangalore torpedo (fig. 188) is improvised from pipe and several two-wheeled axles which are assembled and spaced 16 feet apart. The bangalore torpedo is laid over the axles and made fast. To supplement the charge contained within the bangalore torpedo, two charges weighing 3 pounds each are taped to each section of the torpedo. The normal length of the mobile bangalore torpedo is 80 feet and clears a gap 12 to 18 feet wide. The torpedo is towed as far as possible before being pushed out into the mine field. A skid nose is sometimes attached to the front end for use in rough terrain.



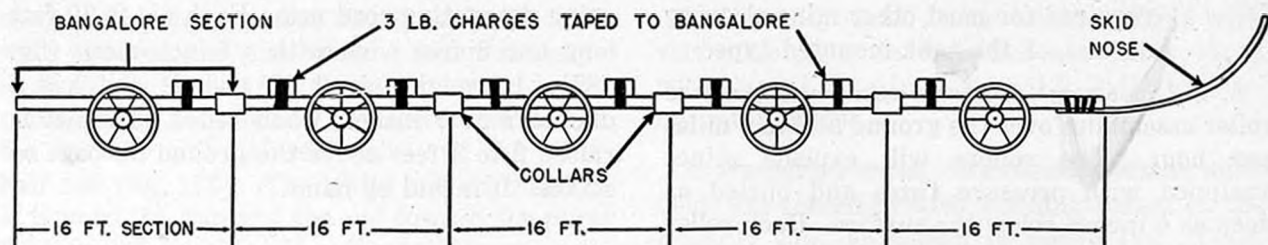


Figure 188. Mobile bangalore torpedo.

### Section III. REMOTE CONTROL DETONATING EQUIPMENT

#### 147. General

Two types of remote control detonating devices were employed by the Germans in World War II. The most recently used equipment consisted of mines laid in a mine field and connected with electrical wiring to a remote control post where a concealed observer could electrically detonate all or part of the mine field (par. 149). The earlier type of remote control mine detonating was by radio (par. 148). The Germans used electrical detonating devices in conjunction with their detector equipment for detecting foot-troop or vehicular approach and underground activity (sec. III, ch. 9).

#### 148. Radio Detonating Device B1 (Fernzündgerät B1; F.Z.B1)

*a. General.* The radio detonating device B1 is designed to fire electric detonators by radio. This device usually employed large charges of explosives hidden in buildings, debris, bridge abutments, and the like, and usually not in mine fields. The radio detonating device B1 is patterned after the Soviet F.10 radio controlled fuze described in detail in TM 5-233A. Each set of equipment consists of two transmitters and five receivers. Each transmitter and receiver is capable of being tuned to any one of five different frequencies. The 15-watt transmitter with battery and transformer, which is designed to be used with a rod aerial and counterpoise ground, serves to originate and send the signal. The receiver, operated by wet cell batteries, is served by a ground antenna and counterpoise. The five interchangeable sets of relays for the receivers and the spare parts for both transmitters and receivers are contained in a small pack.

*b. Transmitter.* The crystal-modulated special transmitter with modulating adjustment is housed in a normal carrying pack, which is a reinforced wooden case with a removable lid. The transmitter fits in an upper compartment, with the converter below. In a special compartment are 11 aerial rods, an aerial base, a transverse head, a counterpoise in 4 parts, a cable for connecting the battery to the transmitter, a square key for winding the clockwork firing switch and for switching on the required signal, and a safety key. The 12-volt wet cell battery (12 NC 28) is in a sheet-metal box. Spare parts for the transmitter, including electron tubes, bulb, 40-ampere fuses, and high- and low-tension brushes, are carried in a small case with a removable lid. The transmitter should be erected clear of trees, walls, or metallic objects.

*c. Receiver.* The receiver, which is set to the frequency of the transmitter, is a crystal-modulated heterodyne receiver served by a ground antenna laid out toward the transmitter. The voltage required for ignition is excited in a pair of terminals. The resultant ignition is indicated by the momentary glowing of a red lamp in the receiver. By means of interchangeable relay sets, the receiver may be set to react to any one of five different signals. The receiver is carried in a container divided into two compartments. The receiver itself is housed in one compartment and the power supply in the other. Each compartment can be separately closed by a waterproof cover. The terminals for the aerial, the counterpoise, and the ignition leads, together with two carrying handles, are all on the outside of the container. One section of the power supply compartment contains the aerial and the counterpoise, and the remainder holds three batteries (2.4 NC 58) in a remov-

able container and one direct-current vibratory converter. Spare relays, electron tubes, bulbs, and vibrator units for the receiver are contained in a small case with a removable lid.

#### 149. Multiple Ignition Set 44 (Mehrfach-zündegerät 44; M.Z. 44)

*a. Description.* The multiple ignition set 44 is an auxiliary device to the obstacle detector set 42 (par. 136). Combination of these two sets makes it possible to detonate individually, at required time intervals, five separate mine circuits, all connected to any one detecting circuit. Each of the mine circuits may contain resistance up to 30 ohms. The two-core cable for the detecting circuit may be up to 3,300 feet long. The main components of the set are one switch case MZS (fig. 189) (Schaltkasten, MZS); one selector set ZV 1; and six resistance distributors MZV (Verteiler, MZV), three of which are spares.

(1) *Switch case.* Located on the front plate of the switch case is a nine-pole switch (Nenfach-Umschalter) and nine corresponding terminals, one large and eight small, with provisions for connecting eight pairs of electric firing heads. Two additional terminals connect the switch case with the ignition cable of the selector set ZV 1 on which the case is mounted. A two-core cable is provided for connecting to a blasting machine, which is the source of current. The blasting machine, either 37 or 39 (Glüzündaparat 37 or 39), is used.

(2) *Resistance distributors.* Each resistance distributor (fig. 192) consists of four 50-ohm resistances in series with five branch leads. The distributor is housed in a short length of steel tubing which is closed with a waterproof seal.

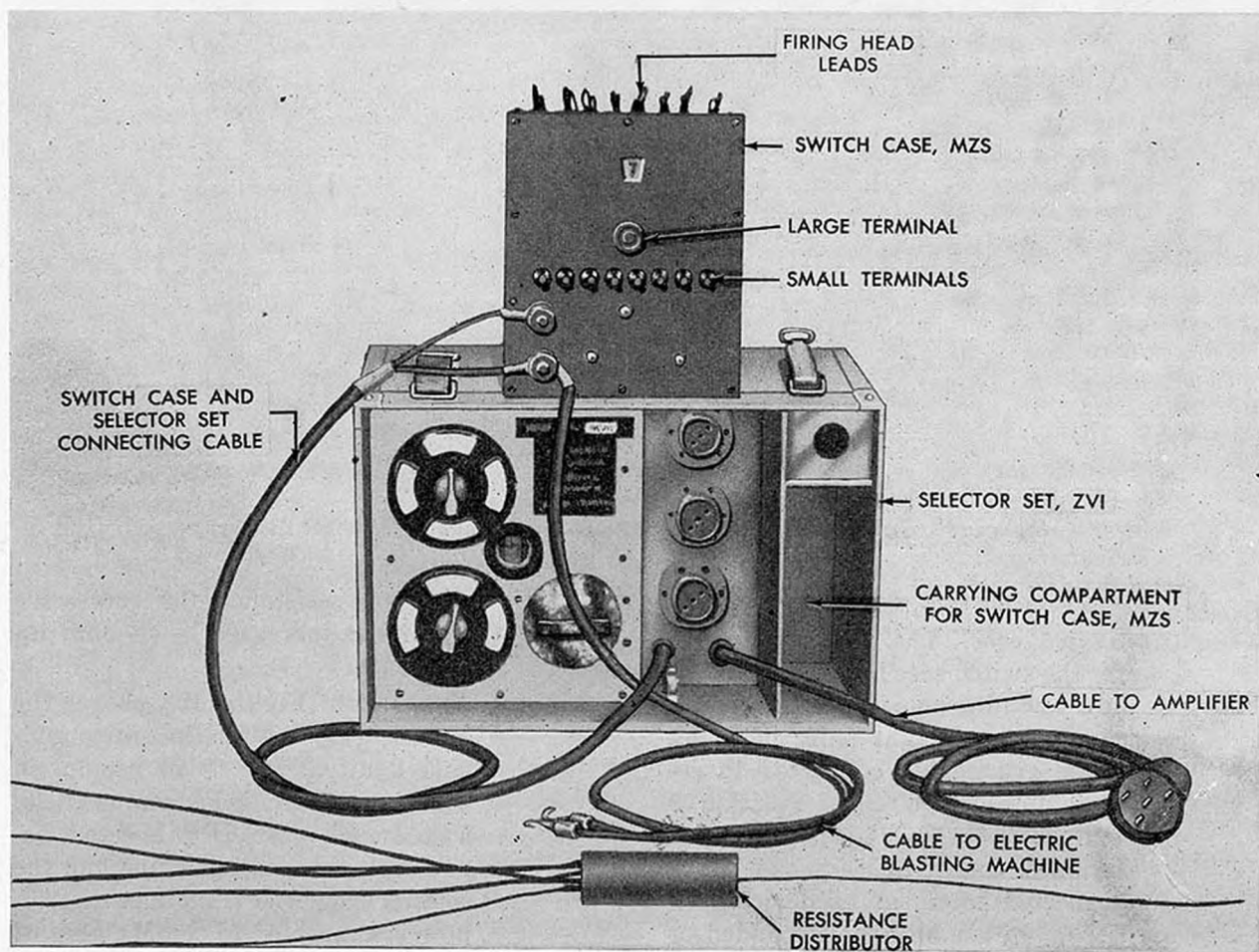


Figure 189. Switch case MZS mounted on selector set ZV 1.



- (3) *Packing.* The switch case is stored in the cable compartment of the selector set (fig. 190). The selector set plug and cable are placed in front of the set and fixed in a bracket specially provided, as shown in figure 190.

sistance of 10,000 ohms connected in parallel.

- (b) *Resistance distributor.* Figure 192 shows the wiring of the resistance distributor with the five leads branching to the mine circuits, so

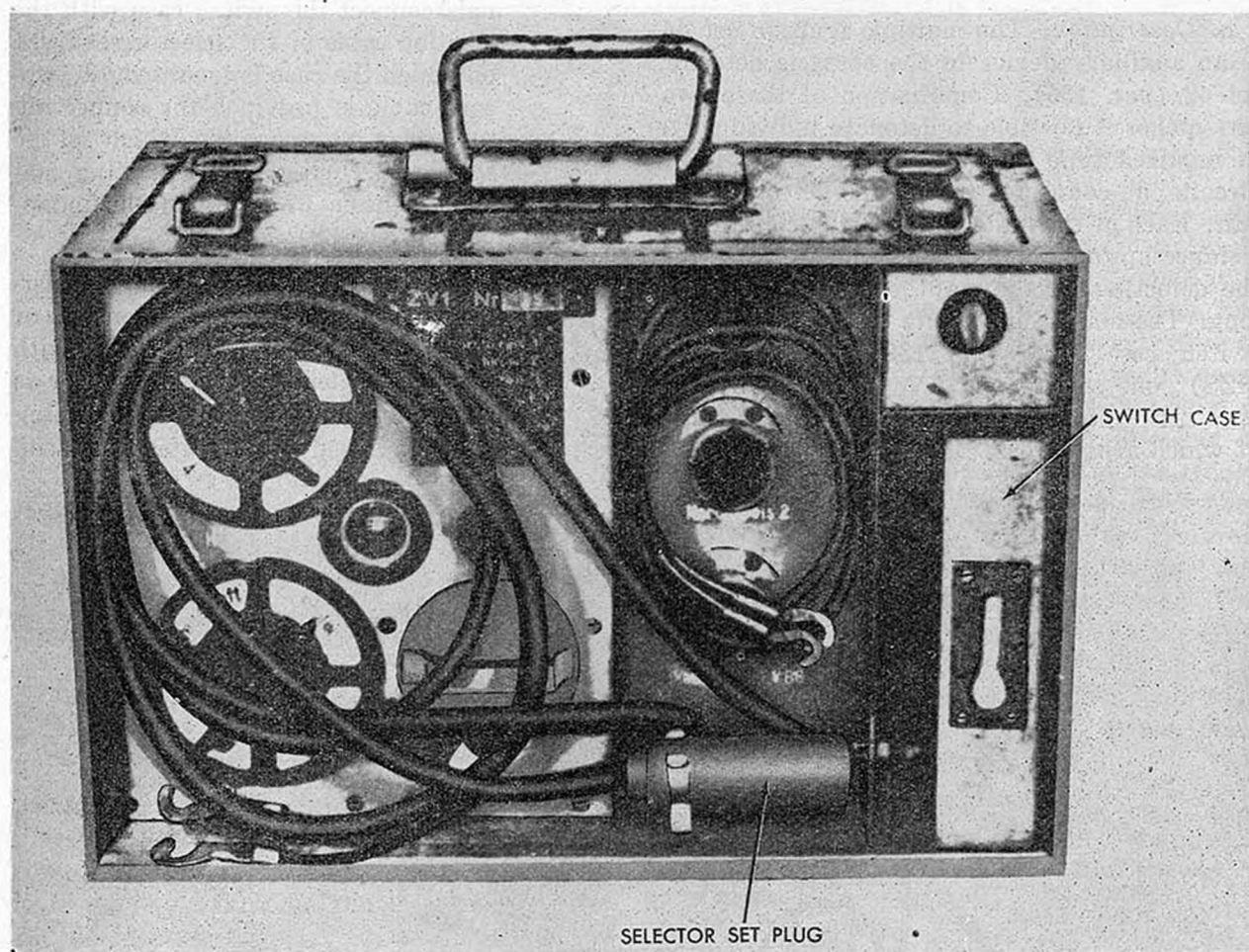


Figure 190. Switch case MZS packed into compartment of selector set ZV 1.

(4) *Electrical wiring.*

- (a) *Switch case.* The wiring diagram for the switch case is shown in figure 204. The nine-pole switch allows the connection of eight pairs of firing heads (each pair connected in series) into the circuit. Position 9 (through pole No. 9) is not equipped for insertion of firing heads but is connected to a safety device consisting of an anti-spark condenser of 1 microfarad and a discharge re-

that the resistance for successive circuits is increased by 50-ohm increments.

- (c) *Entire set.* Figure 193 shows the electrical lay-out for the entire multiple ignition set 44 in use in an acoustically controlled mine field. The switch case is connected between the blasting machine and the selector set. One resistance distributor is connected to the M1 plug of each acoustic sentry which is re-



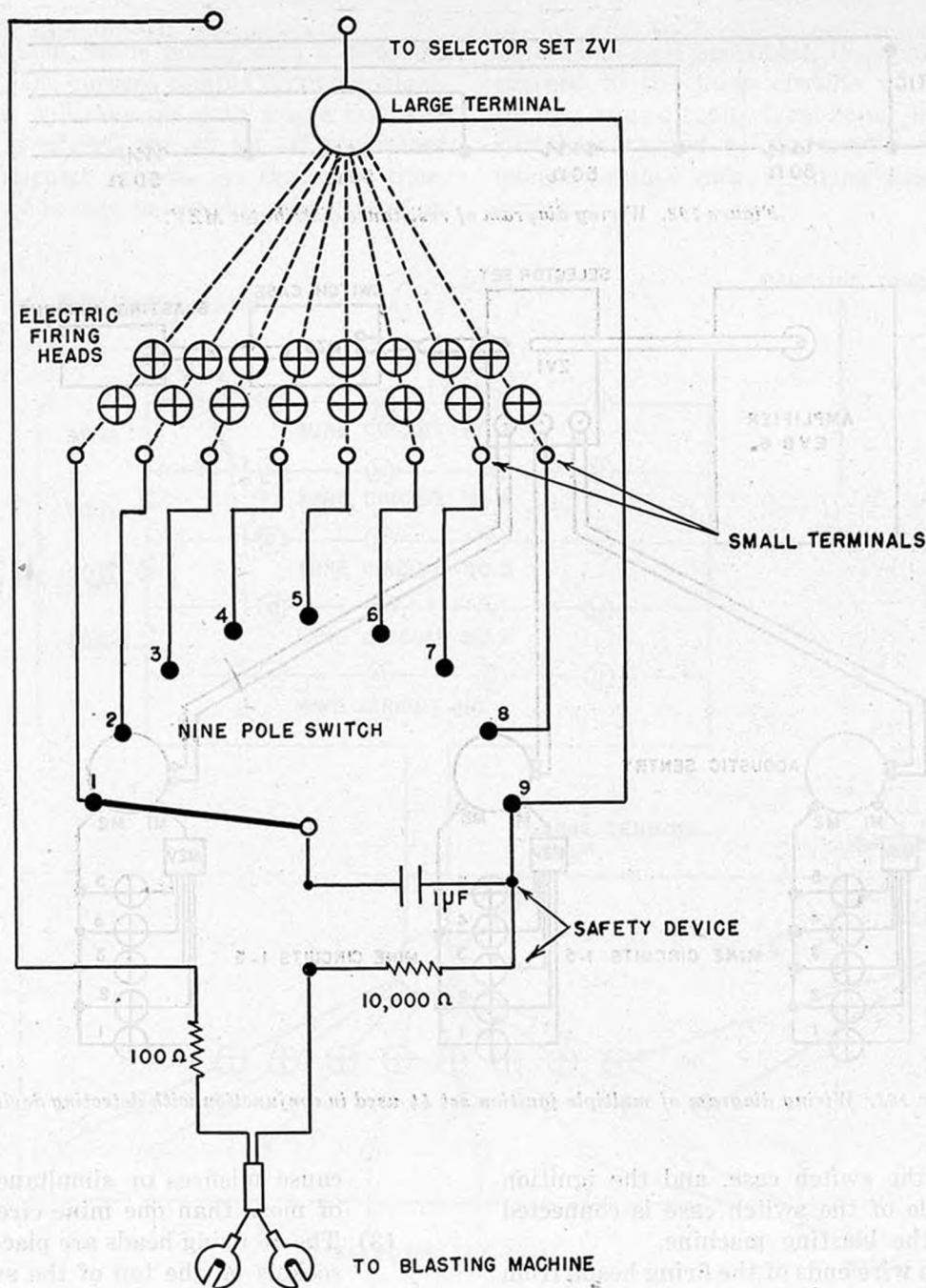


Figure 191. Wiring diagram of switch case.

quired to control more than one mine circuit. The leads to these mine circuits are all joined to the return lead into plug M2. In all other details, the connections are the same as for standard acoustic obstacles as prescribed in paragraph 136.

#### b. Installing.

- (1) The switch case MZS is removed from its shipping position and fixed onto the top plate of the selector set ZV 1 where it is held by a spring-grip arrangement (fig. 189). The connecting cable of the selector set is connected to the two bottom left-hand terminals

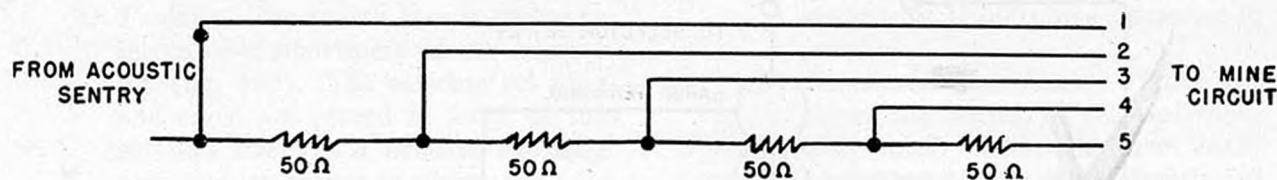


Figure 192. Wiring diagram of resistance distributor MZV.

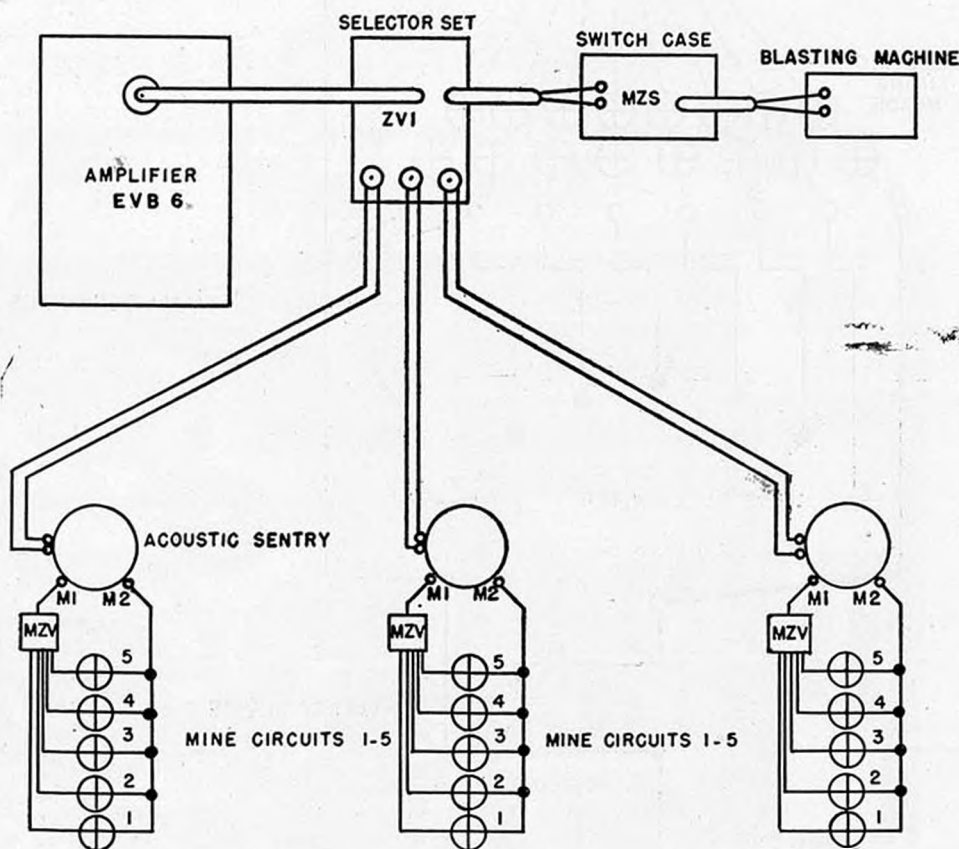


Figure 193. Wiring diagram of multiple ignition set 44 used in conjunction with detecting devices.

on the switch case, and the ignition cable of the switch case is connected to the blasting machine.

- (2) The wire ends of the firing heads from 16 electric blasting caps are then wound together so as to form eight separate pairs of firing heads. Within each pair, the firing heads are connected in series. The resistances in the firing heads must be the same as those in the electric blasting caps used in the mine circuits. Where possible, the electric blasting caps should all be taken from the same shipment, since differences of resistance may

cause misfires or simultaneous firing of more than one mine circuit.

- (3) The 16 firing heads are placed in their sockets on the top of the switch case and are fixed by means of the slide provided.
- (4) An electric blasting cap is inserted immediately behind the resistance distributor in each mine circuit so that the circuit is broken even if the mines should not fire; in this way, subsequent circuits can still be detonated in case of a misfire in one.

c. *Functioning.* As shown in figure 194, the resistance distributor connects all the mine cir-

cuits in parallel, while giving each a different resistance. The current coming from the blasting machine will take the path where the least resistance is offered and so set off the mines in that particular circuit. At the same time, the firing heads inserted in the same circuit in

the switch case are fused, thus cutting off the current to the mine circuits and preventing further mine circuits from being fired until the switch is turned to the next position. This brings another pair of firing heads into the circuit.

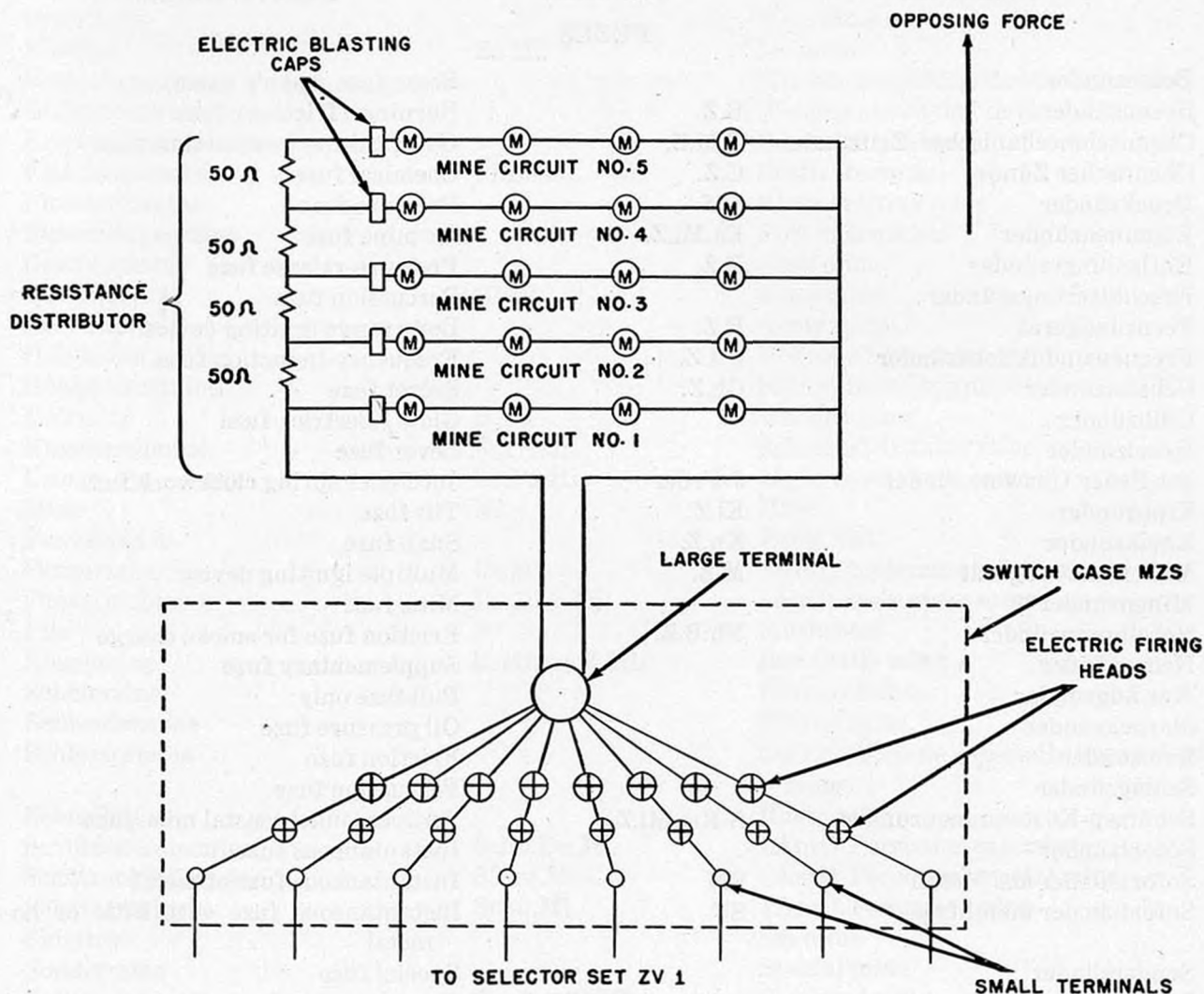


Figure 194. Functioning of multiple ignition set 44.



# GLOSSARY OF GERMAN-ENGLISH MINE WARFARE TERMS

<i>German Name</i>	<i>Abbreviation</i>	<i>English Translation</i>
<b>FUZES</b>		
Bossezünder		Bosse fuze (man's name)
Brennzünder	B.Z.	Burning (friction) fuze
Chemischmechanischer Zeitzünder	C.M.Z.	Chemical-mechanical time fuze
Chemischer Zünder	C.Z.	Chemical fuze
Druckzünder	D.Z.	Pressure fuze
Eisminenzünder	Es.Mi.Z.	Ice mine fuze
Entlastungzünder	E.Z.	Pressure-release fuze
Erschütterungzünder		Percussion fuze
Fernzündgerät	F.Z.	Long range igniting device
Frequenzinduktionszünder	F.I.Z.	Frequency-induction fuze
Geheimzünder	Gh.Z.	Secret fuze
Glühzünder		Glow (electric) fuze
Hebelzünder		Lever fuze
Jot-Feder Uhrwerkzünder	J-Feder	Jot Feder spring clockwork fuze
Kippzünder	Ki.Z.	Tilt fuze
Knickzünder	Kn.Z.	Snap fuze
Mehrfachzündgerät	M.Z.	Multiple igniting device
Minenzünder		Mine fuze
Nebelbrennzünder	Nb.B.Z.	Friction fuze for smoke charge
Nebenzünder		Supplementary fuze
Nur Zugzünder		Pull fuze only
Öldruckzünder		Oil pressure fuze
Reibzünder		Friction fuze
Schlagzünder		Percussion fuze
Schützen-Küstenminenzünder	S-Kst.Mi.Z.	Antipersonnel coastal mine fuze
Sofortzünder		Instantaneous fuze
Sofortzünder aus Metall	SM	Instantaneous fuze of metal
Sofortzünder metallfrei	SF	Instantaneous fuze with little or no metal
Sonderzünder		Special fuze
Splitterminenzünder	S-Minen Z. ; S.Mi.Z.	Shrapnel mine fuze
Stabzünder		Rod fuze
Tellerminezünder	T-minen Z. ; T.Mi.Z.	Plate mine (Teller mine) fuze
Topfminenzünder	To.Mi.Z.	Pot mine (Topfmine) fuze
Uhrwerkzünder		Clockwork fuze
Zeitzünder	Z.	Time-delay fuze
Zug-und-Druckzünder	Z.D.Z.	Pull-pressure fuze
Zug-und-Zerschneidezünder	Z.u.Z.Z.	Pull and release fuze
Zugzünder	Z.Z.	Pull fuze
Zünder	Z.	Fuze (igniter)
Zündersprengkapsel		Percussion cap and detonator holder
Zündschnuranzünder	Zdschn, Anz.	Fuze lighter

## MINES

Behelfsmine		Improvised mine
Beobachtungsmine		Controlled (observed) mine
Brettstückmine		Board mine
Druckbrettmine		Pressure board mine
Druckmine		Pressure mine
Drahtmine		Wire mine
Eismine	Es.Mi.	Ice mine
Entlastungsmine		Wooden antilifting device
Entlastungszünder		Wooden antilifting device
Erschütterungsmine		Concussion mine
Flascheneismine	Fl.Es.Mi.	Bottle ice mine
Flusstreibmine		River drifting mine
Fusschlingenmine		Foot snare mine
Geschossmine		Shell mine
Glasmine	Gl.Mi.	Glass mine
Heeresmine		Army mine
Hohlladungsmine		Hollow charge mine
Hohlsprungmine		Hollow bounding mine
Holzmine	H.Mi.	Wooden mine
Kugeltreibmine	K.Tr.Mi.	Spherical drifting mine
Leichte Panzermine	Le.Pz.Mi.	Light (anti) tank mine
Mine	Mi.	Mine
Panzerfaust		Tank "fist"
Panzermine	Pz.Mi.	(Anti) tank mine
Panzerstabmine	Pz.Stab Mi.	(Anti) tank stake mine
Pilz	P	Mushroom
Riegelmine	R-Mine; R.Mi.	Bar (rail) mine
Scheinmine		Dummy mine
Schleudermine		Sliding mine
Schlossermine		Locksmith mine (specially improvised mine)
Schnellmine		Hasty mine
Schützendosenmine	Schu.Do.Mi.	(Anti) Personnel can mine
Schützenküstenmine	S.Kst.Mi.	(Anti) Personnel coastal mine
Schützenmine	Schü.Mi.	(Anti) Personnel mine
Skimine		Ski mine
Sondermine		Special mine
Splittermine	S-mine; S.Mi.	Shrapnel mine
Sprengriegelmine		Spring bar mine
Sprühbüchse	Sp.Bü.	Spray can (chemical mine)
Stockmine	Sto.Mi.	Picket (stake) mine
Stolperdrahtmine		Trip-wire mine
Tellermine	T-mine; T.Mi.	Plate mine
Topfmine	To.Mi.	Pot mine
Übungsmine	Ubs.Mi.	Training mine
Versteckte Grossladung		Hidden large charge (time-delay fuzed)
Versteckte Kleinladung		Hidden small charge (booby trap)
Vorstrandmine		Beach mine

## MISCELLANEOUS MINE WARFARE EQUIPMENT

Fernhörer		Microphone
Fernzündgerät		Radio detonating device
Geballte Ladung		Concentrated charge
Gestreckte Ladung		Elongated charge (bangalore torpedo)
Glühzündapparat		Blasting machine
Horchtopf		Acoustic sentry
Knallnetz		Detonating net
Knallzündschnur		Detonating cord
Ladung		Charge
Ladungsschieber		Mobile charge
Mehrfachzündegerät		Multiple ignition set
Minenlegerwagen		Mine laying vehicle
Minenmessdraht		Mine spacing wire
Minenräumgerät		Mine clearing device
Minenräumhaken		Mine clearing hook (grapnel)
Minensuchgabel		Mine detecting fork
Minensuchgerät		Mine detecting device (Electrical mine detector)
(Elektrisches Minensuchgerät)		
Minensuchstab	M.S.	Mine detecting rod
Minierhorchgerät		Mine listening equipment
Neunfach-Umschalter		Nine-pole switch
Schaltkasten		Switch case
Sperrenhorchgerät		Obstacle listening device
Sprengbüchse		Demolition block (in a container)
Sprengkapsel	Spr.Kapsel	Detonator
Sprengkörper		Demolition block
Stollenhorchgerät		Mine gallery listening (detector) device
Stollenregistriergerät		Mine gallery registering (recording) device
Sucheisen		Detector iron (mine probe)
Temperaturregler		Temperature regulator
Verteiler		Resistance distributor
Zeitzündschnur		Safety fuze
Zünderhorchgerät		Fuze listening set
Zündersprengkapsel	Z.Spr. Kapsel	Detonator for fuzes
Zündersuchgerät		Fuze detecting set

## GENERAL TERMS

Anlegen von Minensperren	Laying mine obstacles
Behelfs	Improvised
Blind	Unarmed
Bohrpatrone	Bore cartridge (blasting cartridge)
Büchse	Box
Druck	Push, pressure
Durchgang für Einzelschützen	Narrow troop lane through a mine field



## GENERAL TERMS—Continued

Elektrisch		Electrical
Entminen		To demine
Erschütterung		Concussion
Explosion		Explosion
Fertig		Ready-to-go (assembled)
Geht		Go
Gemischtdminensperre		Mixed mine field
Gross		Large
Haft-Hohlladung		Magnetic hollow charge
Horchminensperre		Acoustic mine obstacle
Kasten		Box
Knipser		Switch
Kunststoff		Synthetic plastic
Kurz		Short
Minenarten		Types of mines
Minenfeld (Minensperre)		Mine field (mine obstacle)
Minengasse		Wide lane through a mine field
Minengrundfeld		Mine belt
Minen in Streueinsatz		Hasty mine field
Minenkampf		Mine warfare
Minenkarte		Mine map
Minenlage		Record of available mine stocks
Minenlinie		Mine row
Minenmeldedienst		Mine field record and reports service
Minenmeldung		Mine field report
Minenplan		Mine plan
Minenräumen		Mine clearing
Minenschnellsperre		Hasty mine obstacle
Minenschriftstück		Mine record
Minenskizze		Mine sketch
Minensperre (Minenfeld)		Mine barrier (mine field)
Minensuchen		Mine detecting
Packkasten		Packing case
Panzer	Pz.	Tank
Planladung		Calculated charge
Reinrassige Minensperre		"Pure" mine field (all one type of mine—antitank or antipersonnel)
Rot		Red
Scharf		Armed
Schnell		Quick, hasty
Schnellladung		Hasty charge
Schnellsperre		Hasty obstacle
Schütze	Schu.; S.	(Anti) Personnel, infantryman
Schutzkappe		Protective (shipping) cap
Schwarz		Black
Sicher		Safe
Sicherheit		Safety, security
Sichern gegen Aufnehmen		To secure against lifting
Sichern gegen entschärfen		To secure against neutralizing

## GENERAL TERMS—Continued

Sicherungsbolzen		Safety pin
Splitter	S-; S.	Fragment, splinter (shrapnel)
Sprengkammer		Explosive chamber
Sprengkörper		Explosive body (charge)
Sprüh		Spray
Steht		Stop
Stock	Sto.	Picket, stake
Stück		Piece, part
Stunden		Hours
Tage		Days
Teller	T-; T.	Plate
Topf	To.	Pot
Überwinden von Minensperren		Breaching mine fields
Übung	Ubs.	Training, practice
Umgeändert	Umg.	Modified
Unscharf		Unarmed
Unten		Bottom
Verlegedichte		(Mine) placement density
Vermimen		To mine
Verzögerung		Delay
Wasserdicht		Waterproof
Zeit		Time
Zerknall		Detonation
Zerknallschutzentfernung		Sympathetic detonation safety interval between mines
Zerknallschutzstreifen		Safety zone between mine fields
Zug		Pull

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